A96 Multi-modal Study
STAG Based Appraisal

Case for Change & Preliminary Options Appraisal Report

On behalf of **Aberdeen City Council**

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Executive Summary **7**

1 Study Background **21**
1.1 Overview 21
1.2 Scope of Work 22

2 Problems and Opportunities **25**
2.1 Overview 25
2.2 Corridor Characteristics Overview 26
2.3 Problems 33
2.4 Opportunities 41

3 Transport Planning Objectives **47**
3.1 Introduction 47
3.2 Objective Development Methodology 47
3.3 Emerging Transport Planning Objectives 47

4 Option Development **51**
4.1 Introduction 51
4.2 Initial Option Sifting Process 52
4.3 Guiding Design Principals 52
4.4 Level of Ambition 54
4.5 Option Generation and Design Process 63
4.6 Options: Key Issues and Risks for Consideration 84
4.7 Option Sifting 85

5 Preliminary Options Appraisal **86**
5.1 Appraisal Methodology 86
5.2 Logic Mapping 88
5.3 Options Appraisal 91
5.4 Appraisal Summary 134
5.5 Selection or rejection of options 139

6 Summary and Conclusions **141**
6.1 Summary 141
6.2 Conclusions and Next Steps 141

Figures

Inverurie to Craibstone: Route Variants A, B, C, D and E 13
Craibstone to Printfield Walk: Route Variants A, B, C, D and E 14
and E 14
Figure 1.1: Study Area 21
Figure 1.2: Key Locations on the Corridor 22
Figure 2.1: Strava Metro Heat Map – Aberdeen City 27
Figure 2.2: Strava Metro Heat Map – Dyce / Aberdeenshire[2] 28
Figure 2.3: Current Bus Provision – Aberdeen 29
Figure 2.4: Current Bus Provision – Aberdeenshire 29
Figure 2.5: 2019 Average Daily Traffic Flow on A96 (Mounthooly to A947) 30
Figure 2.6: 2017 vs 2019 Auchmill Average Daily Traffic Flow (pre and post AWPR) 31
Figure 2.7: Corridor Map of Sections – Aberdeen City 33

Figure 2.8: Corridor Map of Sections – Aberdeenshire 34
Figure 4.1: Sustainable Investment Hierarchy 56
Figure 4.2: Two-way segregated cycle track – Examples 57
Figure 4.3: With traffic flow - segregated cycle track - Examples 58
Figure 4.5: Intervention Level 1 – Standard Cycle Lanes - Layout (with 2-way cycle track) 60
Figure 4.6: Intervention Level 2 – Enhanced Cycle Lanes – Layout (with 2-way cycle track) 60
Figure 4.7: Intervention Level 3 - Busway – Layout (with 2-way cycle track) 61
Figure 4.8: Intervention Level 1/2 –Standard / Enhanced Cycle Lanes – Cross-Section (with 1-way with traffic flow cycle tracks) 62
Figure 4.9: Intervention Level 1/2 –Standard / Enhanced Cycle Lanes – Cross-Section (with 2-way cycle track) 63
Figure 4.10: Intervention Level 3 – Busway – – Cross-Section (with 2-way cycle track) 63
Figure 4.11: Corridor segmentation 64
Figure 4.13: All Route Variants 75
Figure 4.14: All Route Variants – Active Travel 76
Figure 4.14: Variants A, B, C, D and E: Inverurie to Craibstone 77
Figure 4.15: Variants A, B, C, D and E: Craibstone to Printfield Walk 78
Figure 4.16: Variant A: Printfield Walk to Mounthooly 79
Figure 4.17: Variant B: Printfield Walk to Mounthooly 80
Figure 4.18: Variant C: Printfield Walk to Mounthooly 81
Figure 4.19: Variant D: Printfield Walk to Mounthooly 82
Figure 4.20: Option Variant E: Printfield Walk to Mounthooly 83
Figure 5.1: Active Travel – Logic Map 89
Figure 5.2: Bus – Logic Map 90
Figure C:1: ASAM14 modelled road network 173
Figure D:2: Bus Routes for Analysis 176
Figure D:3: Bus Journey Time Comparisons – 2037 AM Peak Hour 177
Figure D:4: Bus Journey Time Comparisons – 2037 IP Peak Hour 177
Figure D:5: Bus Journey Time Comparisons – 2037 PM Peak Hour 178
Figure D:6 Route 727 Journey Time – 2037 AM Peak 184
Figure D:7 Route 17 Journey Time – 2037 AM Peak 185
Figure E:1: Option 3B Flow Differences from Do Minimum 188
Figure E:2 Option 3C Flow Differences from Do Minimum 189
Figure E:3: Option 3D Flow Differences from Do Minimum 190
Figure I:1: Land Reallocation requirements (Printfield Walk to Mounthooly) 230
Figure J:1: How do you make these journeys? 235
Figure J:2: Which area best describes where you live or where your business is based? 237
Figure J:3: Which of the two active travel options do you think would be most appropriate along the A96? 238
Figure J:4: Would your preferred option encourage you to change your travel behaviour? 238
Figure J:5: What level of bus priority do you think is more appropriate along the A96? 240
Figure J:6: Do you have a preference between the four route options? 241
Figure J:7: Would your preferred route option encourage you to change your travel behaviour? 242
Figure J:8: Please entre the first four digits of your postcode? 245
Figure J:9: Which gender do you identify with? 246
Figure J:10: What was your age at your last birthday? 246
Figure J:11: What is your current employment status? 247
Figure J:12: Do you have a health condition or illness which affects your personal mobility? 247
Figure J:13: Does your illness or health condition affect your ability to use public transport? 248
Figure J:14: Which of the following best describes the annual income of your household (before tax)? 249

Tables

Appraisal Summary – Key Advantages and Disadvantages – Active Travel Options and Bus Priority Intervention Levels 16
Appraisal Summary – Key Features – Option Variants 18
Option Selection or Rejection 19

Table 2.1: Corridor Sections 34
Table 2.2: Corridor Wide Problems – Summary 36
Table 2.3: Opportunities 42
Table 3.1: Emerging Transport Planning Objectives and Measures for Monitoring and Evaluation 48
Table 4.1: Guiding Design Principles 53
Table 4.2: Interventions under Do Minimum, Do Something and Do Gold scenarios 55
Table 4.3 Active Travel Provision – Advantages and Disadvantages 58
Table 4.4: Bus Intervention Levels – Advantages and Disadvantages 61
Table 4.5: Bus Corridor Segments Description 65
Table 4.6: High Level Option Description 71
Table 4.7: Summary of bus route variants 74
Table 4.8: Key Issues 84
Table 5.1: STAG seven-point scale 86
Table 5.2: - Appraisal Table - TPOs 92
Table 5.3: - Appraisal Table – STAG Criteria 105
Table 5.4: - Appraisal Summary – Scores 135
Table 5.5: - Appraisal Summary – Key Advantages and Disadvantages – Active Travel options and Bus Priority Intervention Levels 136
Table 5.6: - Appraisal Summary – Key Features – Option Variants 137
Table 5.7: Option Selection or Rejection 139
Table A:1: Option Generation – Initial sift of options from previous studies 145
Table D:3: Route 10 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options) 178
Table D:4: Route 16 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options) 179
Table D:5: Route 17 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options) 180
Table D:6: Route 20X – Journey Time Comparison – Peak Hour (Do Minimum vs. Options) 181
Table D:7: Route 727 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options) 182
Table D:8: Car vs Bus – Journey Time Comparison (by option) 183
Table E:1: 24 hr two-way flow change from Do Minimum 186
Table E:2: 24 hr two-way flow reduction percentage compared to Do Minimum 187
Figure E:4: Option 3E Flow Differences from Do Minimum 190
Table F.1: TUBA Input Parameters 193
Table F:2: TUBA Sector Masking 195
Table F:3: TUBA Road Benefits 196
Table F:4: TUBA Public Transport Benefits 197
Table F.5 TUBA Road and Public Transport Benefits 198
Table F.6: Public Transport Benefit to Cost Ratios (BCRs) 199
Table F.7: TUBA Road and Public Transport Benefit to Cost Ratios (BCRs) 200
Table F:8: Existing Cycle Demand 203
Table F:9: TEMPRO Growth Factors 203
Table F.10: Future Cycle Demand 204
Table F.11: AMAT Inputs 205
Table F.12: Pedestrian + Cycle Infrastructure Costs (£) (2021 prices, excluding Optimism Bias) 206
Table F.13: AMAT Results Summary – Option 1 Variants 206
Table F.14: AMAT Results Summary – Option 2 Variants 207
Table F.15: AMAT Results Summary – Option 3 Variants 207
Table F.16: Sensitivity Tests Defined 208
Table F.17: Sensitivity Test Results (Option 2C) 208
Table G:1: Hansen Accessibility Analysis Results 212
Table H:1: Cost Rates and Units for Typical Types of Road Infrastructure 217
Table H:2: Cost Summary 228
Table J:1: Stakeholders Contacted 231

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Executive Summary

Background

Stantec was appointed in December 2019 to undertake a Scottish Transport Appraisal Guidance (STAG) based appraisal of the A96 corridor between Inverurie and Aberdeen City Centre. The aim of the study is to build on previously identified and appraised options for improving transport connections to effectively function for all road users, paying particular attention to active travel and public transport connections, between Inverurie and Aberdeen City Centre along the A96 and related routes.

The publication of the Scottish Government's updated ***Climate Change Plan*** in 2020 set out revised climate change related targets including: reducing car kilometres by 20% and phasing out the need for petrol and diesel vehicles by 2030; and supporting transformational active travel projects. Furthermore, the ***Reducing Car Use for a Healthier, Fairer and Greener Scotland*** (2022) publication outlines the route map to achieving the 20% reduction in car kilometres by 2030, and describes the key sustainable travel behaviours which make up the framework, including investing in the public transport network.

Scotland's **National Transport Strategy 2** (NTS2), published in 2020 presents the '*Sustainable Travel Hierarchy*' and '*Sustainable Investment Hierarchy'*, which together guide decision making by promoting walking, wheeling, cycling, public transport and shared transport options in preference to single occupancy private cars.

This strong underpinning policy context offers strengthened opportunities for successfully developing and implementing sustainable transport schemes and from the outset, the study aim has been to provide **transformational and more sustainable travel options** which can encourage modal shift towards walking, cycling and public transport.

This study, along with the similar multi-modal corridor studies for Aberdeen's other main arterial routes, is also feeding into the development of Aberdeen Rapid Transit (ART), where the ambition is to develop a **high quality, high frequency mass transit network across the city on key corridors and linking key destinations, anchored by P&R facilities** on each corridor. ART has national recognition within Transport Scotland's draft ***Strategic Transport Projects Review 2*** (STPR2) and in the Scottish Government's Draft **National Planning Framework 4** (NPF4). The work undertaken as part of this A96 Multi-modal study has recognised throughout, the need to develop options which could facilitate the successful delivery of ART on the corridor.

Case for Change

The first stage of the STAG process is to complete an initial *Case for Change* which primarily focuses on identifying the transport problems and any potential opportunities in the corridor. Several existing studies provided a wealth of relevant data analysis in relation to the corridor, and it was recognised that, from this there is already an established evidence base which provides a foundation for the identification of problems and opportunities. The collation of the previously identified problems and opportunities, further data analysis where appropriate, a three-day site visit, a stakeholder engagement exercise (to validate previously identified problems and identify new problems) and environmental constraints mapping therefore fed into the Case for Change.

Problems

A range of problems was identified and are set out in this report alongside their supply side root cause and the travel and societal consequences they cause. From this a set of Transport Planning Objectives (TPOs) has been derived which clearly link back to the problems identified.

The problems identified for the corridor and the resultant TPOs are presented in the table below.

No.	Transport problem (from a user's perspective)	Study sub-objective	TPO
1	The environment provides low amenity or unsatisfactory conditions for local **walking and wheeling**	Improve and maintain the quality of the pedestrian environment and address the barriers which affect some groups moving around when walking or wheeling	**TPO1**: Improve the quality of the pedestrian experience, and address the barriers which affect people moving around as pedestrians along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre
2	**Walking and wheeling** routes can be indirect compared to crow-fly and can be disjointed / severed	Improve the coherence and directness of walking routes in the corridor	
3	**Cycling** journeys on designated routes are fragmented and inconvenient	Improve journey quality, times and safety for cyclists along the transport corridors	**TPO2:** Improve the quality of the cycling experience, and address the barriers which prevent many people cycling along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre
4	There are safety concerns around cycling in the corridor which prevent people from **cycling**	Address safety concerns to increase cycling participation in corridor	
5	**Bus services** in the corridor are perceived to be of poor quality / poor value for money	Improve the quality (real and perceived) of bus services in the corridor	**TPO3:** Improve the quality of bus travel in the corridor for all users, enhancing the network and the travel experience both for current bus users and to attract new users
6	Many **bus stops** do not provide a high quality, comfortable and informed waiting environment	Improve the quality of bus stops and the facilities provided there	
7	The **bus network** in the corridor is focussed on Aberdeen city centre	Reduce the need for interchange when travelling from the corridor across the city	
8	Access to **bus services** can be restrictive	Improve access to public transport for those with impaired mobility / health	
9	**P&R** options are in practice limited to Inverurie and Kintore	Increase the use of P&R in the corridor as a substitute for car travel	
10	**Bus journey times** are long, particularly compared with private car and rail	Reduce journey times by bus, and narrow the gap between bus and car journey times	**TPO4**: Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times
11	**Bus journey times** can be unreliable or are perceived to be unreliable	Improve bus punctuality on services in the corridor	
12	Long **bus journey times** between Dyce Station and Aberdeen Airport	Improve connectivity between Dyce Station and Aberdeen Airport	
13	High **cost** (or perceived cost) of **bus** (relative to income)	Reduce the cost of public transport where this is a demonstrable deterrent to people travelling	*While recognising that addressing the cost of bus travel (or the perception) is an issue, especially in terms of ensuring equality of access, bus fares are set by commercial operators and Aberdeen City Council and Aberdeenshire Council do not have control over this.*
14	High **cost** (or perceived cost) of **bus** (relative to car ownership and usage)	Address the cost of public transport where this is a demonstrable deterrent to its use	
15	**Station car parks** at Dyce and Inverurie are often full	Station car parking should be used efficiently, and 'genuine' park and ride travel is provided for	**TPO5**: Improve active travel and bus travel integration with, and access to, rail services in the corridor
16	It is not always possible to get a seat on **peak hour rail** services	Seating capacity should not act as a constraint on rail travel in the corridor	
17	It is not always possible to access the **rail network** by bus around Aberdeenshire	Improve bus / rail interchange in the corridor	

No.	Transport problem (from a user's perspective)	Study sub-objective	TPO
18	**Car and commercial vehicle**-based journey times are extended and unreliable during peak periods due to congestion	Manage journey time for general traffic to prevent traffic re-routing in the corridor	**TPO6:** Manage general traffic to minimise traffic re-routeing onto secondary and local routes as defined by the North East Roads Hierarchy

Opportunities

Recent changes across the policy landscape, most notably around climate change, present decision makers with a clear rationale and justification to implement the changes and behavioural change catalysts required in the transport system. As noted above, the publication of the Scottish Government's updated *Climate Change Plan* (2020), the *Reducing car use for a healthier, fairer and greener Scotland* (2022) publication, Transport Scotland's draft STPR2 and Scotland's NTS2 all provide clear opportunity for developing and implementing transformational sustainable transport schemes.

The completion of the Aberdeen Western Peripheral Route (AWPR) has enabled traffic to route around Aberdeen city. This has provided the opportunity to reassess the roads hierarchy within the city, prioritise sustainable transport infrastructure and facilities on routes into the centre and bring forward the City Centre Masterplan schemes. Furthermore, the **Transport (Scotland) Act 2019** provides local authorities with the powers to implement a workplace parking license scheme and Low Emission Zone (LEZ). Such complementary 'demand management' measures are likely to encourage the use of more sustainable modes and support the success of sustainable transport schemes.

The underutilised Park & Ride site at Craibstone offers a ready-made opportunity, if the appropriate level of services, competitiveness and journey quality could be achieved (as envisaged under the ART scheme). Bus operators are investing in new vehicles and fuelling infrastructure, utilising both electric and hydrogen-based technologies. Such vehicles offer environmental benefits and will help to improve perceptions of bus travel, and there is the opportunity to capitalise on these investments through complementary bus priority infrastructure.

Preliminary Options Appraisal

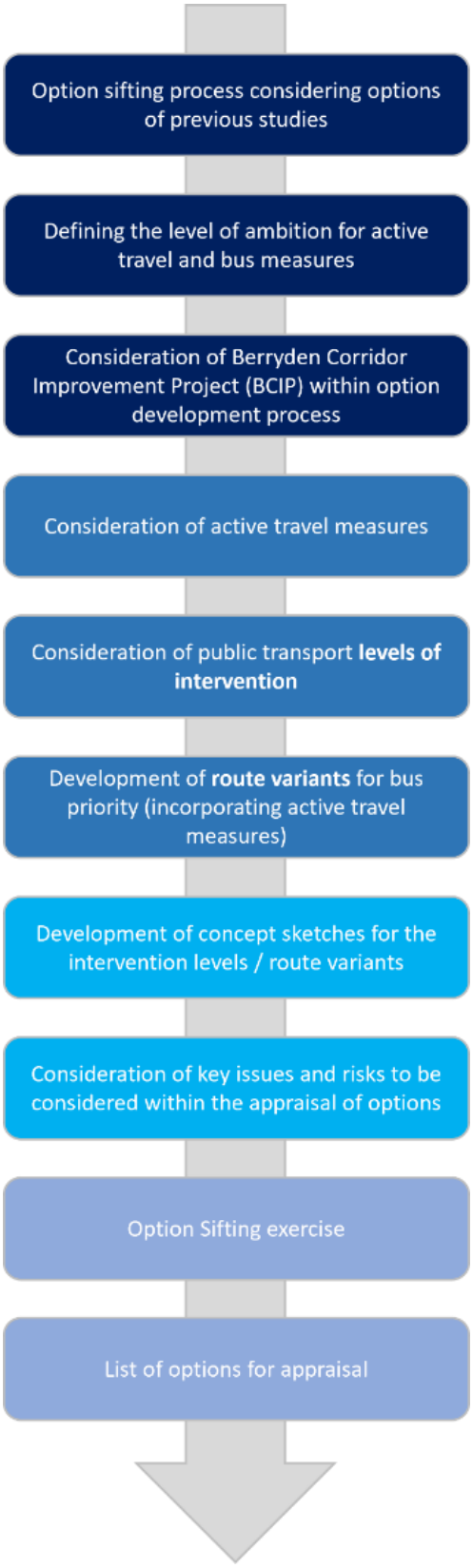
Option Development

The development of active travel and public transport options has been based on developing **transformational schemes** that can deliver the TPOs for the study, and by doing so, address the issues identified along the corridor related to walking, cycling and bus use.

To develop truly transformational schemes and meet the ambitions of the study, and also recognising the needs of ART, an **end-to-end corridor-based approach** to option development has been adopted, considering potential corridor length schemes between Inverurie and Mounthooly roundabout, and with each scheme incorporating both bus and active travel elements. A separate technical report, *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022*, provides extensive detail on the option development process.

A set of guiding design principles was developed to describe the key attributes that make a particular mode of transport attractive to use. From this, the level of ambition was set but, to give flexibility to the option generation and development process, and in recognition that all the design risks have yet to be established, a scalable ambition was developed.

The option development process can be seen the figure opposite.



Active Travel

In line with Transport Scotland's Sustainable Travel Hierarchy, active travel provision along the corridor was considered first, over and above other modes of transport. In the rural area of the corridor between **Inverurie and Craibstone roundabout**, a part new and part upgraded shared-use path, running parallel to the A96 is proposed.

In the more urban area of the corridor between **Craibstone roundabout and Mounthooly** roundabout / city centre, two forms of **continuous dedicated cycling provision** have been considered (with the images below highlighting similar infrastructure elsewhere):

- A **two-way segregated cycle track** (provided on one side of the carriageway)
- A **one-way (with traffic flow) segregated cycle track** provided on each side of the carriageway.

For consistency in provision, and to aid user understanding and follow best practice, these two types of provision have been considered as separate options i.e., either the two-way segregated cycle track is provided along the corridor (between Craibstone and Mounthooly / city centre), or the one-way (with traffic flow) segregated cycle tracks on each side of the carriageway is provided i.e., 'mixing and matching' the two types along the corridor has not been considered. Under both proposed active travel options there would be complete segregation for cyclists from traffic (in line with Scottish Cycling By Design guidance for a road of this nature).

Furthermore, it is assumed that in addition to the cycle track, **footway improvements** between Craibstone and Mounthooly / city centre would include tightening junction geometries to reduce pedestrian crossing time and to slow traffic speeds as they enter and exit side arm roads. Note that general improvements in terms of footway quality, maintenance, removal of street clutter etc. were agreed as 'Do Minimum' measures and as such do not explicitly form part of the options but are assumed to be in place to improve the pedestrian environment.

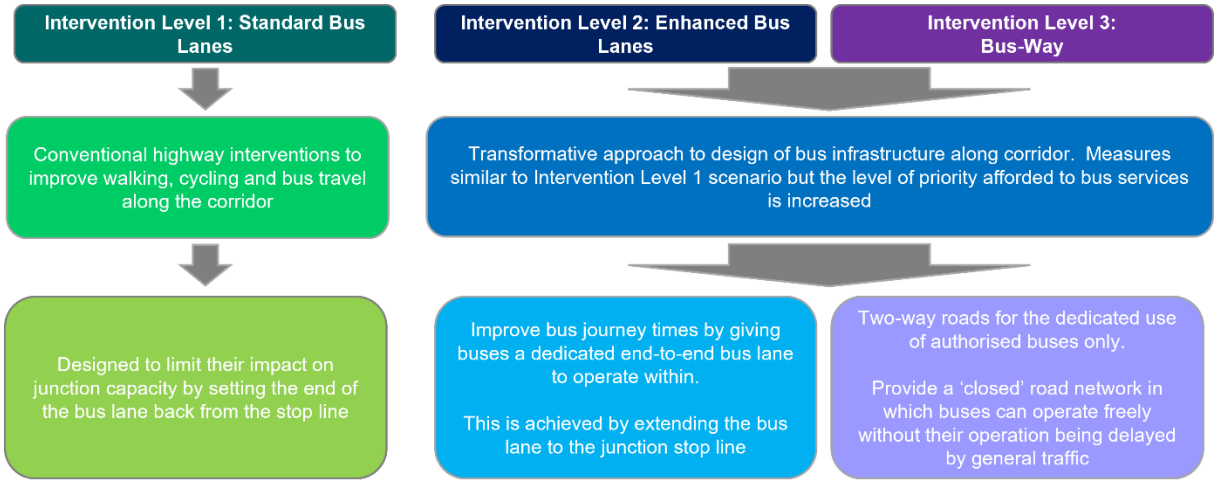
Greater detail on the active travel infrastructure proposed can be found in the main body of this report, and in the *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022*.

Bus

After consideration of active travel provision along the corridor, three bus 'intervention levels' were then developed, ranging in ambition as shown below. It is assumed that continuous bus priority would be provided in the form of intervention level 1, 2 or 3 between Craibstone roundabout and Mounthooly roundabout / city centre. Between Inverurie and Craibstone roundabout, on the trunk road network, bus priority does not form part of the proposals as there is not sufficient delay to justify this. However, a standalone improvement is considered at Port Elphinstone as discussed below.

All three intervention levels require the reallocation, in both directions, of a lane of the existing carriageway from general traffic to bus only between Craibstone roundabout and Mounthooly roundabout / city centre.

The active travel options as noted above (two-way cycle track or one-way (with traffic flow) segregated cycle tracks) are assumed to be implemented alongside all levels of intervention for bus.

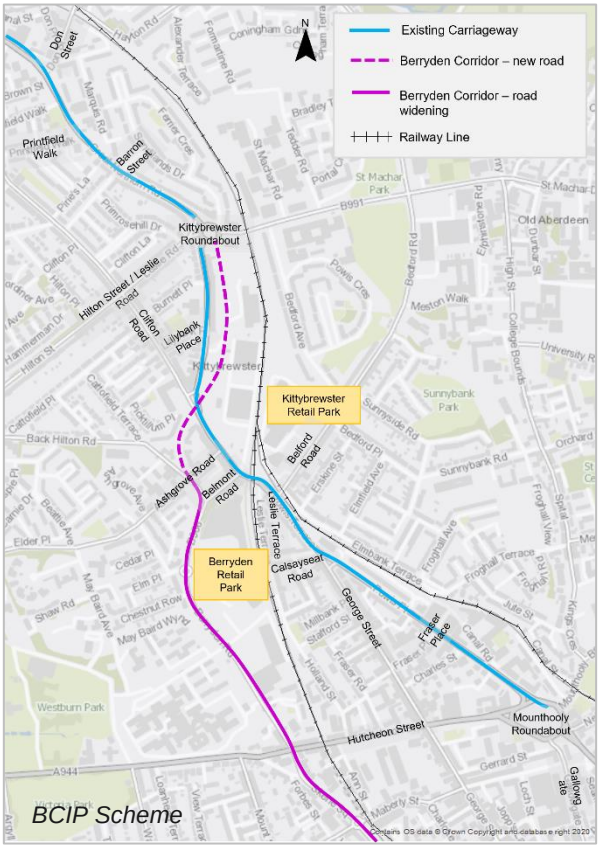


An example of intervention level 3, the busway, is shown below (photos are of a scheme in Swansea).

Route Options

A range of potential 'route' options (combining both active travel and bus infrastructure) were developed by applying good practice design guidance to bus priority and cycling and walking infrastructure, whilst taking account of the physical constraints along the corridor.

These route variants take cognisance of the committed Berryden Corridor Improvement Project (BCIP) being progressed by Aberdeen City Council. This scheme (as shown in the figure opposite) will deliver a new / upgraded dual carriageway linking Skene Square to the A96 at Kittybrewster Roundabout and represents a substantial change to the road network.



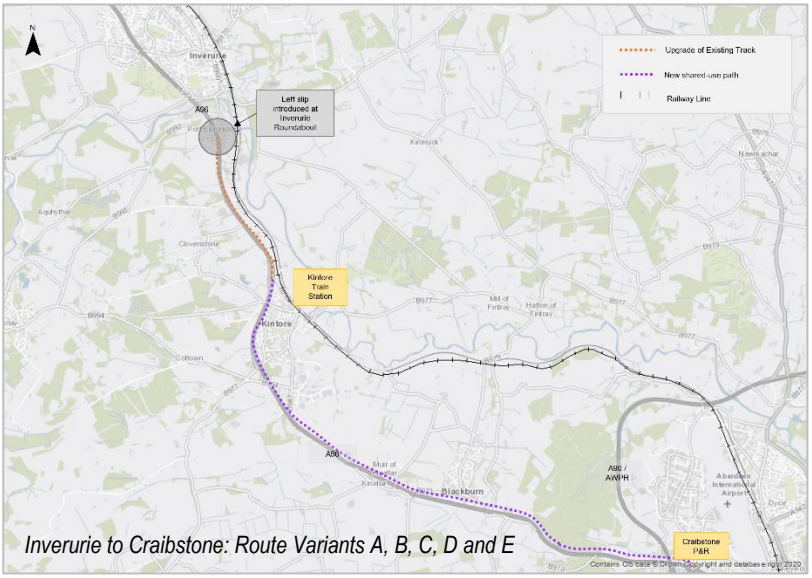
The BCIP presents several significant challenges and opportunities for this study which have been considered during option development and the subsequent appraisal. For the purposes of option generation, and reflecting the policy environment, it was assumed that the BCIP (and the additional road capacity it creates) should be considered as an opportunity for the study. Route options which utilise the BCIP (i.e., reallocate road space in the Berryden corridor), in part or wholly, have therefore been considered.

Five different end-to-end 'route' variants were proposed (A, B, C, D and E) under each of the three bus priority Intervention Levels, giving a total of 15 options. **All options accommodate the continuous one-way (with flow) segregated cycle tracks or the two-way segregated tracks as discussed above**.

Variant A assumes the BCIP is not in place. Between Inverurie and Kittybrewster roundabout, the five route variants (A, B, C, D and E) are the same, following the A96, and are shown below. Thereafter, the five route variant proposals between Kittybrewster roundabout and Mounthooly roundabout / the city centre are set out.

Inverurie to Craibstone

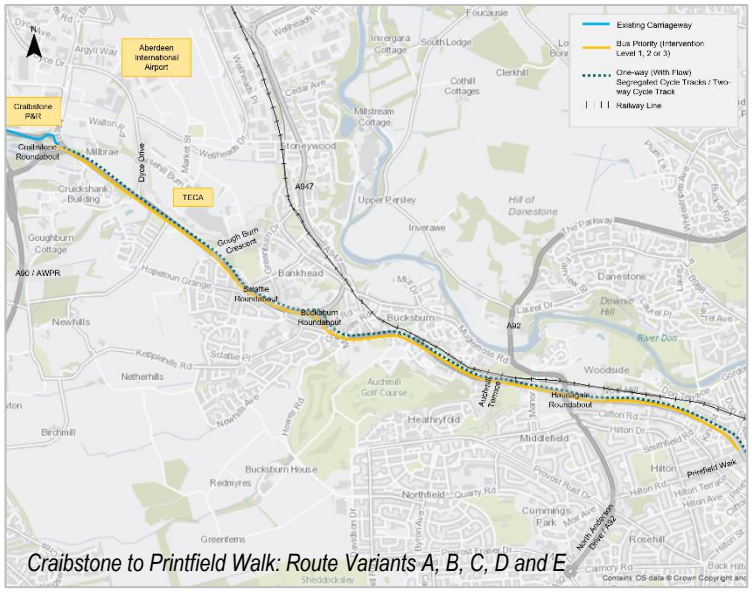
Active Travel: There is an existing shared-use path between Inverurie and Kintore which would be upgraded to ensure consistency with the corridor active travel proposals. Aberdeenshire Council is progressing an active travel route option between Kintore and Blackburn. However, the route is on an off-line alignment and as such, the proposals here include a new shared use path aligned with the A96. All route options include a new active travel route between



Blackburn and Craibstone, adjacent to the A96 (this proposed shared-use path would link the existing and planned provision between Inverurie and Blackburn). This would provide a continuous shared-use active travel route between Inverurie and Craibstone Roundabout (a shared-use route is considered appropriate along this section of the corridor given the anticipated walking and cycling volumes in this less urban environment).

Bus: There are minimal delays to bus services between Inverurie and Craibstone except for some delay experienced exiting Inverurie onto the A96 trunk road. As such, no interventions are planned along the A96, except for a stand-alone junction improvement (slip lane) at Port Elphinstone to enable all traffic to more easily exit Elphinstone Road onto the A96 eastbound.

There is a potential third-party land requirement along the full length of this section to accommodate the shared-use Inverurie to Craibstone active travel route.



Craibstone to Printfield Walk: Route Variants A, B, C, D and E

Craibstone to Printfield Walk

Active Travel: A two-way segregated cycle track (located on the northern side of the carriageway) or one-way (with traffic flow) segregated cycle tracks. Footway improvements to tighten junction geometries and reduce pedestrian crossing time and to slow traffic speeds as they enter and exit side roads.

Bus: Standard bus lanes, enhanced bus lanes or the busway are proposed for the full length of this section with the capacity for general traffic reduced to a single lane between junctions or also at junctions in the case of the latter two.

Potential third-party land requirement along the full length of the section

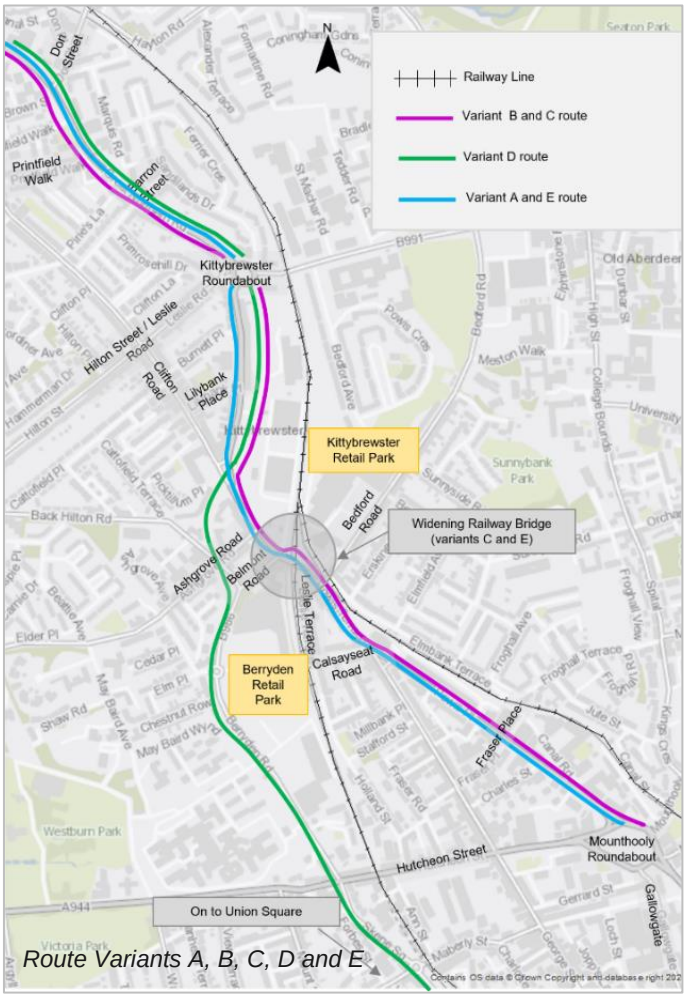
Printfield Walk / Kittybrewster to city centre route variants

As noted above, five route variants are considered for routeing into the city centre south of Kittybrewster roundabout.

In terms of **bus** priority, intervention level 1, 2 or 3 would be applied across these route variants. The five **variants** (as shown in the figure below) can be defined by (heading into Aberdeen):

- The end point, either Mounthooly or Union Square - and by implication its route from the A96 / Clifton Road junction either along the new BCIP or via the A96 Powis Terrace / Powis Place
- Its route between Kittybrewster roundabout and the A96 / Clifton Road junction, either via the BCIP or Great Northern Road
- Whether the Belmont Road railway bridge is widened or not

As noted above, in terms of the intervention levels, the route variants B, C and D require the reallocation, in both directions, of a lane of the existing carriageway from general traffic to bus only along the BCIP between Kittybrewster roundabout and Clifton Road (variant A has been developed assuming the BCIP is not in place, and variant E routes via the current Great Northern Road). Similar road space reallocation is also required either on the A96 Powis Terrace / Powis Place (variants A, B, C and E), or on the southern section of the BCIP scheme and Skene Square, Woolmanhill and Denburn (variant D).



Route Variants A, B, C, D and E

Summary of bus priority route variants

Route Variants	End point	BCIP South (Kittybrewster-Union Square)	BCIP North (Kittybrewster-Clifton Road)	Gt Northern Road (Kittybrewster-Clifton Road)	Belmont Road Bridge widening (Kittybrewster to Mounthooly)
A	Mounthooly	NA	NA	✓	×
B	Mounthooly	×	✓	×	×
C	Mounthooly	×	✓	×	✓
D	Union Square	✓	✓	×	×
E	Mounthooly	×	×	✓	✓

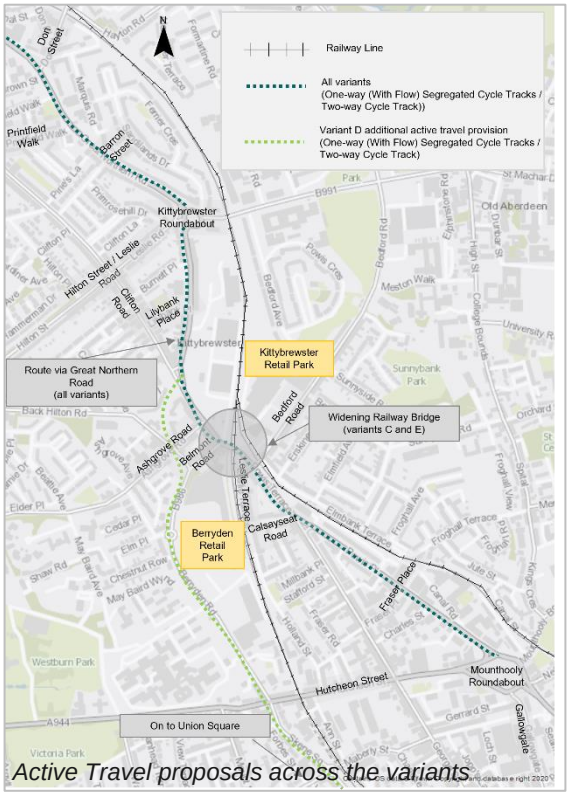
Variant A is not discussed further as it was sifted out before the options appraisal was undertaken (details of the variant can be found in the main body of this report).

Furthermore, all variants assume road widening between Kittybrewster Roundabout and Printfield Walk with a loss of parking and a potential third-party land requirement. If this were not possible, traffic 'gating' would be implemented to provide bus priority (this would reduce traffic queuing in this narrower section of the corridor, allowing buses to receive a level of priority over general traffic).

Active Travel: Alongside the bus priority route variants as set out above, cycling provision (as shown in the route variant image opposite) is provided by either:

- the segregated two-way cycle track (on the northern side of Great Northern Road until Kittybrewster Roundabout, where it crosses the road to continue on the eastern side of Great Northern Road, before reaching the new junction at Great Northern Road / Clifton Road), or

- one-way (with traffic flow) segregated cycle tracks on both sides of the carriageway.



The route then continues down Powis Terrace and Powis Place to Mounthooly Roundabout (as either the segregated two-way cycle track or one-way with traffic flow segregated tracks).

Under variant D, additional active travel provision is proposed along the BCIP south of Clifton Road and onwards to Union Square. It is recognised that active travel provision has been included in the BCIP design, but this may need upgrading / altering to provide a consistent level of provision across the full A96 corridor.

Individual images (concept sketches) showing greater detail for each option can be found both within the main body of this report with more detailed concept drawings contained within the studies associated technical report, *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022.*

Options Appraisal

In line with STAG, the Preliminary Options Appraisal has appraised each option against: the study TPOs, STAG Criteria (Environment, Safety, Economy, Integration and Accessibility and Social Inclusion), Established Policy Directives, Feasibility, Affordability, and Public Acceptability. Use of the ASAM[1] model provided quantitative outputs to inform the appraisal.

The tables below summarise the main advantages and disadvantages in relation to the active travel proposals, the three bus intervention levels and the four route options.

Appraisal Summary – Key Advantages and Disadvantages – Active Travel Options and Bus Priority Intervention Levels

	Advantages	Disadvantages
Pedestrian Improvements	• Safety benefits through reduced conflicts between pedestrians and cyclists due to segregated cycle tracks (between Craibstone and Mounthooly / city centre) • Improved signalised junctions integrated to enable effective pedestrian crossings • Improvements to the pedestrian environment were welcomed by respondents to the public survey	

[1] Aberdeen Sub-Area Model

	Advantages	Disadvantages
	(undertaken to support the options appraisal)	
One-way (With Flow) Segregated Cycle Tracks	• Step change improvement to walking, cycling and wheeling provision – with improved safety and security • Reduced pedestrian conflict (on currently signed shared footway areas) • Generally easier to accommodate at large complex signalised junctions • Generally better connectivity to other cycle routes • Response to the public survey, undertaken to support the options appraisal, welcomed segregated cycling infrastructure	• Less space efficient and flexible • Less coherent for users when the cycle track is detached from the road • Cyclists may incorrectly use the track in the wrong direction if it is easier than crossing a major road • Not easily compatible with intervention level 3 (busway)
Two-way Segregated Cycle Track	• Step change improvement to walking, cycling and wheeling provision - with significantly improved safety and security • Reduced pedestrian conflict (on currently signed shared footway areas) • More space efficient (requires less additional land take) • More coherent when the cycle track is detached from the road (e.g., along high-speed roads / dual carriageways) • Quicker to grit / de-ice and remove snow, with likely lower maintenance costs than one way with-flow tracks • 41% of respondents to the public engagement survey, undertaken to support the options appraisal, noted that they would prefer a two-way segregated cycle track (as opposed to one-way (with flow) segregated cycle tracks)	• Connectivity for some cyclists to and from the track can be more difficult to manage • Cycle traffic at risk from both left and right turning traffic entering side roads • Moving between the cycle track and road is more difficult for cyclist travelling against the flow of traffic. • Cyclists may be dazzled by the headlights of oncoming vehicles especially in rural locations where there is no street lighting • Potential for accidents if cyclists are travelling towards each other on steep sections
Intervention Level 1 (Standard bus lanes)	• Adaptable bus scheme - hours of operation or use by other vehicles (e.g., commercial vehicles) could be accommodated if necessary • Introduces fully accessible bus stops • Minimal general traffic journey time or re-routing impacts • Measures partly align with climate change policy • 60% of respondents to the public survey noted a preference for some level of bus priority on the corridor (with 19% stating intervention level 1 as their preference)	• Less transformational and scores the lowest against many of the study TPOs and STAG criteria • Lower public journey time and reliability benefits • Unlikely to result in a significant increase in bus use due to minimal journey time benefits • Relocation of on-street parking required
Intervention Level 2 (Enhanced bus lanes)	• Adaptable bus scheme – hours of operation or use by other vehicles (e.g., commercial vehicles) could be accommodated if necessary • Significant improvement to bus journey times and service reliability • Likely to increase bus use with environmental and safety benefits and improve opportunities to access jobs and education	• Significant general traffic re-routeing to be managed • Generates increases to general traffic journey times along the corridor • Relocation of on-street parking required

	Advantages	Disadvantages
	• Measures align more closely to climate change policy and action • 60% of respondents to the public survey noted a preference for some level of bus priority on the corridor (with 20% stating intervention level 2 as their preference)	
Intervention Level 3 (Busway)	• Transformative change to bus services along the corridor with faster journey times and reliable services • Provides fully accessible bus stops with high quality waiting environments • Likely to increase bus use with greater air quality and safety and benefits • Improves opportunities to access jobs and education • Measure aligns more closely to climate change policy and action • Opportunity to convert the busway to a tramway in the future • 60% of respondents to the public survey noted a preference for some level of bus priority on the corridor (with 21% stating intervention level 3 as their preference)	• Significantly higher cost than intervention level 2 without significantly greater journey time benefits • Bespoke vehicles may be required to operate within the busway which may require investment in new vehicles and associated maintenance / depot requirements • Significant traffic re-routing impacts to be managed • Generates increases to general traffic journey times along the corridor • Scheme generally less adaptable once built • Relocation of on-street parking required

Appraisal Summary – Key Features – Option Variants

Route Variant	Route Description (Between Kittybrewster Roundabout and Mounthooly Roundabout / City Centre)	Key Features
B	Routes along the committed BCIP scheme between Kittybrewster roundabout and Powis Terrace, and Powis Terrace / Powis Place to Mounthooly	• Does not provide continuous bus priority and therefore generates the smallest reductions in bus journey times across all route variants • Lowest cost variant (capital cost of active travel and bus measures estimated at £21m - £71m (at 2021 prices) dependent on the intervention level) • Only 5% of respondents to the public survey noted a preference for this route variant
C	Routes along the committed BCIP scheme between Kittybrewster Roundabout and Powis Terrace, and Powis Terrace / Powis Place to Mounthooly, with road widening at Belmont Road Railway Bridge	• Offers significant bus journey time improvements over variant B due to the provision of continuous bus priority along the corridor between Craibstone and Mounthooly roundabout • Requires costly bridge widening / replacement • High cost variant (capital cost of active travel and bus measures estimated at £33m - £95m (at 2021 prices) dependent on the intervention level) • 10% of respondents to the public survey noted a preference for this route variant
D	Routes along the committed BCIP scheme between Kittybrewster Roundabout and Skene Square, and onwards to Union Square	• Offers the greatest bus journey time improvements for re-routed services to bus / railway station at Union Square but would not benefit (and may produce disbenefits) for passengers going to Powis Terrace / Powis Place etc • Provides continuous bus priority to Aberdeen bus and rail station • Would need sufficient bus services to re-route down Berryden Corridor to justify scheme • Significant increases in general traffic journey times and traffic re-routeing, and as such, has the greatest

Route Variant	Route Description (Between Kittybrewster Roundabout and Mounthooly Roundabout / City Centre)	Key Features
		negative impacts on fuel use and greenhouse gas emissions • Likely to significantly negatively impact on the BCIP objectives and outcomes • Variant cost higher than variant B but lower than variants C and E (capital cost of active travel and bus measures estimated at £23m - £80m (at 2021 prices) dependent on the intervention level) • 17% of respondents to the public survey noted a preference for this route variant
E	Routes along Great Northern Road between Kittybrewster Roundabout and Powis Terrace / Powis Place (does not use BCIP scheme)	• Offers significant bus journey time improvements over variant B • Provides continuous bus priority due to the provision of continuous bus priority along the corridor between Craibstone and Mounthooly roundabout • Requires costly bridge widening / replacement • Requires complex junction redesign at Berryden Corridor / Powis Terrace junction to accommodate the new access to Great Northern Road • High cost variant (capital cost of both active travel and bus measures estimated at £36m - £95m (at 2021 prices) dependent on the intervention level) • Only 8% of respondents to the public survey noted a preference for this route variant

This study has been undertaken as the country transitions out of the COVID-19 pandemic. Consideration has been given within the appraisal to both the potential positive and negative impacts of the pandemic on the viability of the options and their ability to support a 'green recovery' from the pandemic, and to 'lock-in' positive pandemic behaviours e.g., increased active travel. As the region transitions out of the pandemic, close monitoring of travel behaviour and trends will provide an understanding of the structural impacts of the pandemic and enable a robust business case to be developed to allow for appropriate decision making.

Option Selection or Rejection

The table below presents the key rationale for selection or rejection of options at this stage in the appraisal process. Note that all options below are assumed to incorporate active travel provision – using either one-way with flow cycle tracks or a two-way cycle track, as well as improvements to the pedestrian environment.

Option Selection or Rejection

Intervention Level	Variant	Select	Rationale for selection or rejection
Intervention Level 1 (Standard bus lanes)	B	✓	Provides bus journey time improvements with less significant impacts to general traffic (than intervention levels 2 or 3) and lower overall costs given no bridge widening (as required under variants C and E).
	C	✓	Provides bus journey time improvements with less significant impacts to general traffic (than intervention levels 2 or 3).
	D	×	While variant D offers the greatest public transport benefits in terms of access to the railway and bus station in Aberdeen, there are likely to be disbenefits to those users whose services are re-routed but who have a destination on Powis Terrace / Powis Place and to the north of the city centre. Stagecoach and FirstBus indicated the key

Intervention Level	Variant	Select	Rationale for selection or rejection
			passenger market is on Powis Terrace / Powis Place and may be disinclined to reroute services. Variant D also generates the most significant disbenefits to general traffic in terms of traffic re-routeing and subsequent fuel use and associated greenhouse gases. The variant is likely to negatively impact on the BCIP objectives and outcomes and require a redesign of the BCIP scheme to accommodate the proposals. As such, it may be hard to justify any change to the already committed BCIP scheme and explain the changes to the general public.
	E	✓	Provides bus journey time improvements with less significant impacts to general traffic (than intervention levels 2 or 3). Variant E also has less of an impact on the committed BCIP scheme compared to variants B and C.
Intervention Level 2 (Enhanced bus lanes)	B	✓	Provides bus journey time improvements and a transformative scheme that aligns well with national policy and is likely to generate modal shift.
	C	✓	Provides significant bus journey time improvements and a transformative scheme that aligns well with national policy and is likely to generate modal shift.
	D	×	As above for 1D.
	E	✓	Provides significant bus journey time improvements and a transformative scheme that aligns well with national policy and is likely to generate modal shift. Variant E also has less of an impact on the committed BCIP scheme compared to variants B and C.
Intervention Level 3 (Busway)	B	×	The additional costs of the busway level of intervention do not generate a commensurate reduction in bus journey times. This makes the additional cost of the busway difficult to justify over intervention level 2 (the enhanced bus lanes). The busway would also be less adaptable than the bus lane intervention levels 1 and 2 and may also require investment in bespoke vehicles / may only be usable by specific vehicles, lowering its overall benefit. Also note comments above for 1D in relation to 3D.
	C	×	
	D	×	
	E	×	

1 Study Background

1.1 Overview

1.1.1 Stantec was appointed in December 2019 to assist Aberdeen City Council to undertake a Scottish Transport Appraisal Guidance (STAG) based appraisal of the A96 corridor between Inverurie and Aberdeen City Centre. The aim of the study is to build on previously identified and appraised options for improving transport connections to effectively function for all road users, paying particular attention to active travel and public transport connections, between Inverurie and Aberdeen City Centre along the A96 and related routes.

1.1.2 From the outset, the study aim has been to provide **transformational sustainable travel options** which can encourage modal shift towards walking, cycling and public transport.

Study Area

1.1.3 The approximate study area is shown in Figure 1.1.

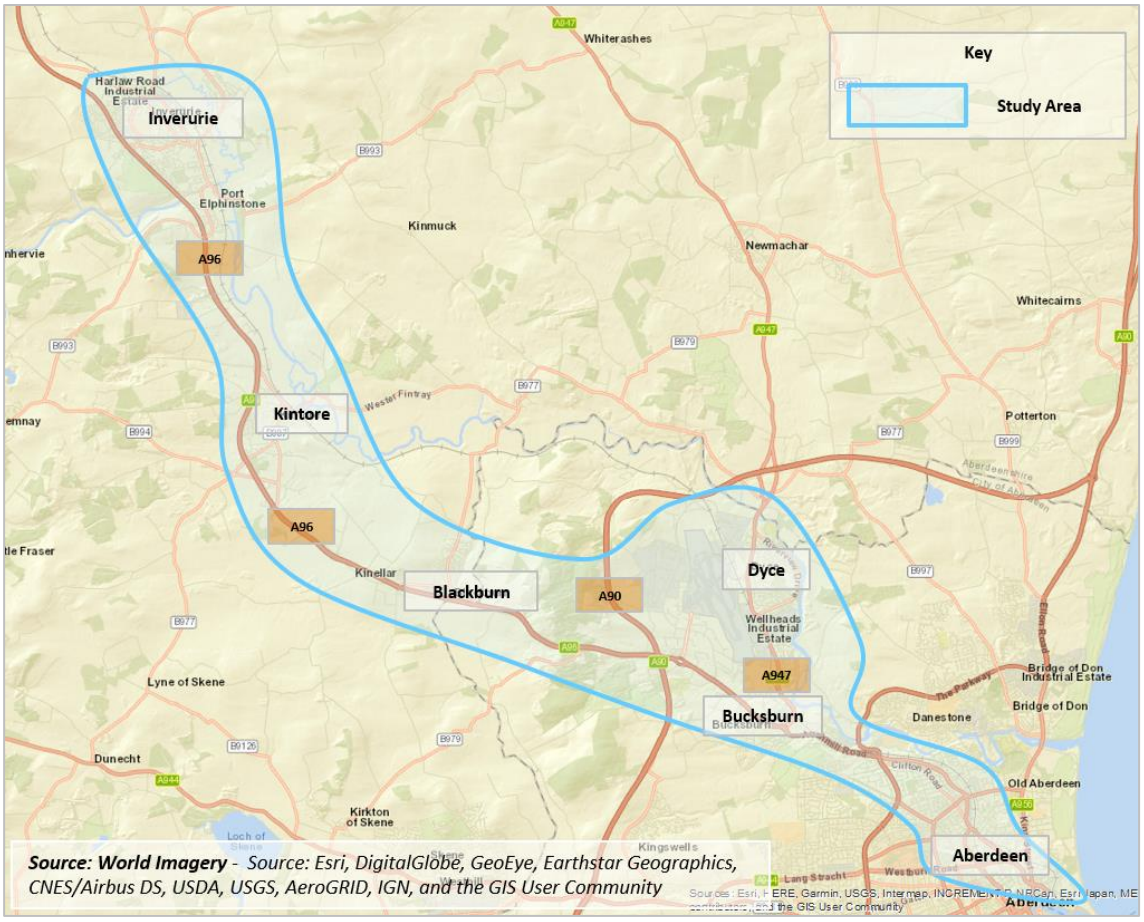


Figure 1.1: Study Area

1.1.4 The A96 corridor runs broadly from east to west between Aberdeen city centre, Bucksburn, Blackburn, Kintore and Inverurie. The AWPR crosses the A96 junction west of the airport access road with a link from the A96/Airport access roundabout to join the AWPR south-west of the junction. The junction provides strategic access onto the wider trunk road network.

1.1.5 The A96 route has key trip generators and attractors along its length including settlements, development sites, centres of employment (namely Aberdeen city centre, Dyce and Kirkhill

industrial estate), the airport and leisure facilities, most notably The Event Complex Aberdeen (TECA), as shown in Figure 1.2.

1.1.6 In addition, the A96 also provides access to the Aberdeen University campus located close to St. Machar roundabout, to the North East Scotland College campus site at Gallowgate and to the Berryden and Kittybrewster retails parks. The corridor, therefore, has bi-directional demand along its length, i.e., not solely focused on getting people into Aberdeen City Centre.

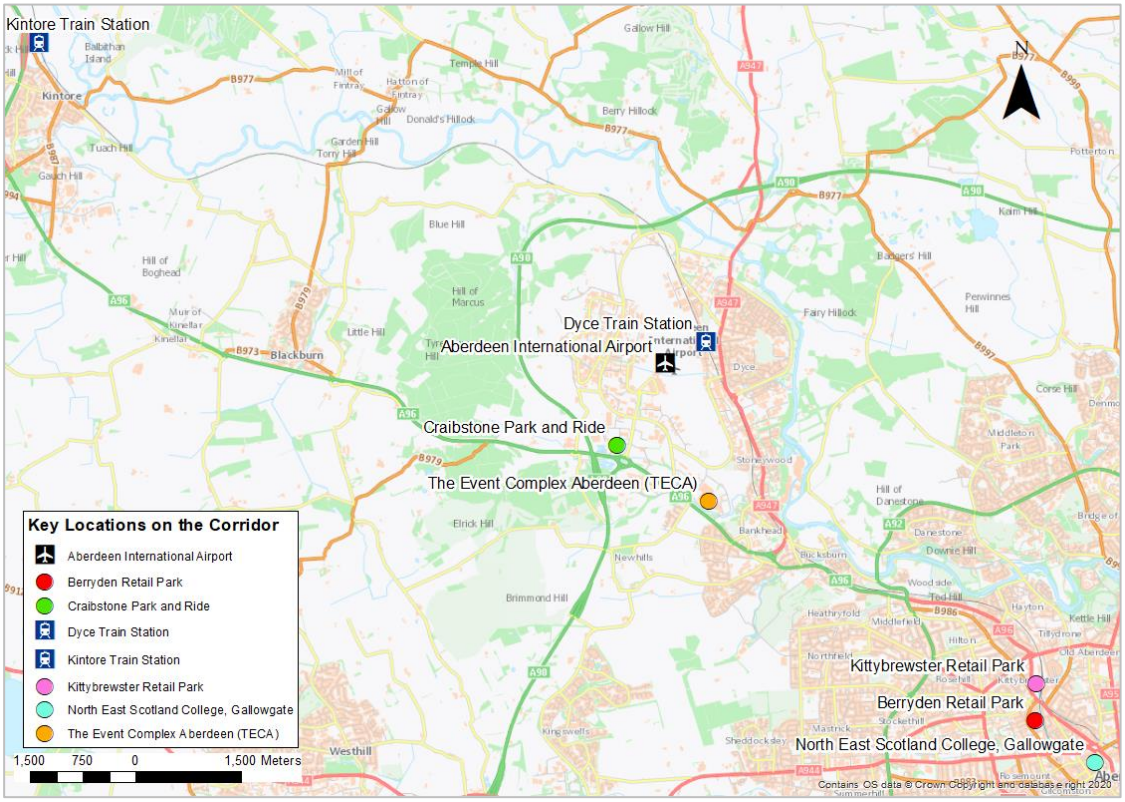


Figure 1.2: Key Locations on the Corridor

1.1.7 Both Aberdeen City and Aberdeenshire have high car mode shares. Despite this, however, there is still a significant proportion of residents who depend on other modes of transport. Combined with decreasing bus patronage and relatively low active travel uptake, the region's networks are dominated by car-based trips. Regional and national policy, however, seeks to arrest these trends and encourage more sustainable transport uptake, to support population health and social inclusion and to assist the Scottish Government in their aims of reducing carbon emissions and decarbonisation of the vehicle fleet by 2032 with the aim that: *By 2032 our roads will contain no new petrol and diesel cars and vans; we will have almost completely decarbonised our passenger railways; and we will have begun to work to decarbonise challenging transport modes, such as HGVs, ferries and aviation. Car kilometres will have reduced by 20%, and sustainable transport will be the instinctive first choice for people*[2].

1.2 Scope of Work

1.2.1 The purpose of the study is to build on previously identified and appraised options for improving transport connections between Inverurie and Aberdeen City Centre. The study reflects the status of this A96 route within the revised North East Scotland Roads Hierarchy.

[2] *Update to the Climate Change Plan 2018-2032 - Securing a Green Recovery on a Path to Net Zero, Scottish Government*, January 2021

1.2.2 The study is considering the corridor in a holistic manner, looking at both eastbound and westbound movements and recognising development aspirations and pressures in both Aberdeen and Aberdeenshire.

1.2.3 Following a STAG-based approach, the study has been undertaken in a proportionate manner, recognising, and building on the work that has already been undertaken in relation to the corridor.

1.2.4 The key output of this study is a set of costed, indicative dimensioned preliminary design interventions, which are feasible and deliverable, and have demonstrable benefits, to enable the local authorities and partners to further develop them for implementation.

1.2.5 While the focus of the study is on the development of *sustainable* transport interventions, due regard has been given to, and assessment undertaken of, the likely impact that the proposed interventions will have on all modes, including general traffic and freight. In particular, reflecting the status of the A96 as a priority route in the revised Roads Hierarchy, interventions have considered the competitiveness of public transport and active travel over other modes, while not encouraging car and freight traffic onto alternative less appropriate routes. The study has sought to identify and design interventions of varying levels of impact, to support this environment and minimise / or mitigate unintended routeing consequences.

1.2.6 The scope of work has therefore covered:

- **Development of the Case for Change**:
  - **Identification and analysis of transport-related problems and opportunities along the A96** - both existing problems and opportunities and those likely to arise in the future. Given the wealth of information from the findings of previous and ongoing work in relation to the A96, this study has taken a proportionate look at all the available information and utilised this to streamline the development of the Case for Change
  - **Identification of developments under construction or allocated within the Aberdeen and Aberdeenshire Local Development Plans** that are on or near the corridor which are likely to intensify usage of the corridor
  - **Review and validation of stakeholder problems and opportunities** – through a review of the wealth of engagement activity undertaken as part of existing studies, and a revalidation exercise where stakeholders were issued with a Briefing Note and asked to either validate problems they had previously identified or provide clarity if these had changed, or new problems or opportunities had emerged. Individual calls were undertaken with the bus operators to provide additional clarity, especially given the impacts of the COVID-19 pandemic (note that further engagement was undertaken with both stakeholders and the public as part of the options appraisal process and is detailed within the appraisal chapter of this report)
  - **Establishment of a baseline** (pre COVID-19 pandemic lockdown), in terms of existing public transport infrastructure and service provision, including journey times, average speed, punctuality and reliability. Given the long-term nature of restrictions due to COVID-19, the focus has been on establishing a ‘core’ pre-COVID baseline. Potential longer-term impacts due to the pandemic have been considered and are discussed within this report
  - **Development of Transport Planning Objectives** (TPOs) and the **establishment of a future monitoring framework** to assess the impacts (particularly on bus services) of any improvements
  - **Generation of design options for addressing the problems and opportunities identified** and for meeting the TPOs, focussing on **transformational** options with the potential to provide significant benefits for active travel and public transport users

- **High-level sifting of options** before the preliminary options appraisal work

- **Preliminary Options Appraisal:**

  - **High-level STAG-based appraisal** of all options, including the **identification of undesirable general traffic routeing** not in line with the revised Roads Hierarchy

  - **Development of high-level preliminary designs** for the appraised options

- **Identification of the best-performing design options** for the Councils and partners to further develop for implementation

2 Problems and Opportunities

2.1 Overview

2.1.1 The first stage of the STAG appraisal process is to complete an initial *Case for Change* which primarily focuses on identifying what the transport problems are and any potential opportunities. This stage of the STAG process is becoming increasingly important in Transport Scotland's decision-making process and thus a robust Case for Change provides an efficient transition through the decision-making gates and can lead to the unlocking of appropriate funding sources downstream.

2.1.2 Several existing studies, which have included a wealth of relevant data analysis, are available in relation to the corridor and provide a strong platform from which this study has built. In particular, the key documents of relevance are:

- *A96 Collective Travel Study* (AECOM, April 2018). The study considered collective travel measures along the A96 corridor between Inverurie and Aberdeen City Centre. It is important to note that this study was undertaken prior to the opening of the Aberdeen Western Peripheral Route (AWPR) and Kintore railway station
- *Dyce Travel Planning* study (Atkins, May 2020). The study was undertaken to better understand commuting movements of those working in the Dyce area of Aberdeen and encourage businesses to collaborate and promote sustainable transport use
- Previous feasibility work on A96 cycle route improvements:
    - *Aberdeen to Blackburn Cycleway Feasibility Study* (Aberdeen City Council, September 2009) undertaken to consider cycleway feasibility between Aberdeen, Dyce, and Blackburn
    - Kintore to Blackburn Cycle Route – Option 3 Detailed Feasibility Study (AECOM, May 2019) undertaken to examine the potential for a shared use route for vehicles, cyclists and pedestrians connecting Kintore and Blackburn along the former toll road. (Note that design work has further progressed and the link is to be completed in 2023/24).

2.1.3 A number of further existing studies are available, and have been reviewed, including:

- Nestrans Active Travel Action Plan 2014 – 2035 (2014)
- Aberdeen City and Shire Cumulative Transport Appraisal (2018)
- Aberdeen Sustainable Urban Mobility Plan (2019)
- CIVITA PORTIS Park & Ride Market Research and Action Plan (2018)
- Aberdeen City Region Strategic Transport Appraisal (2020)
- Aberdeen Integrated Travel Towns (2018)
- Aberdeen Cross City Transport Connections (2019)

2.1.4 Taking cognisance of the extensive analysis that has already been undertaken for the A96 corridor, it is recognised that there is already an established evidence base which provides a foundation for the identification of problems and opportunities. Reflecting this, a proportionate approach in line with STAG has been, undertaken which has drawn heavily on this available evidence, supplemented with additional analysis to:

- collate all the information collected and analysed to date
- report the problems identified in the corridor and develop a range of Transport Planning Objectives reflecting these
- provide an extensive databank to drawn on as options are developed and then appraised

2.1.5 Together these three elements have provided a comprehensive platform from which option development and appraisal has been undertaken from a fully informed position.

2.1.6 Full details of the work undertaken is presented in *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note, Stantec, May 2021,* and included:

- **Extraction and consideration of previously collated relevant socio-economic, traffic and transportation datasets**, including Census, NOMIS, BRES, traffic counts etc.
- **Extraction and collation of noted problems and opportunities and objectives from studies ongoing/completed** within the study corridor
- **A 'gap analysis' exercise** to establish what further data analysis was required to inform the study
- **Further information gathering and data analysis to infill missing data** to both inform the identification of problems and feed into robust option appraisal. Additional analysis covers all modes of transport (traffic volumes, journey times and variability, bus journey times and variability, cycle route use etc.) and provides up to date mapping of bus routes and active travel infrastructure
- **Site visits** involving travelling along the corridor and auditing the available infrastructure. This included the development of mode specific 'proforma's to score the various level of service associated with each mode along the corridor and to identify potential problems with the supply side of the network. These proforma were completed during a three-day site visit 'audit' with route sections subsequently assigned a walking, cycling, and bus 'pass' or 'fail' score as to whether the section already met a suitable standard to be included in the integrated network
- A **stakeholder engagement exercise** to validate the problems, identify further problems and highlight opportunities. Engagement was undertaken through a Stakeholder Workshop, through a series of one-to -one phone calls and through the dissemination of an editable Briefing Note with key questions to be completed. Recognising that many stakeholders had been engaged with as part of the *A96 Collective Travel Study*, the engagement programme sought validation of the already stated problems from that study's engagement exercise, with an opportunity for stakeholders to identify new problems and opportunities or note changed priorities (especially in light of the COVID19 pandemic and the potential longer-term impacts to travel)
- **Environmental Constraints Mapping** to provide insight into constraints to be borne in mind during option development and appraisal

2.2 Corridor Characteristics Overview

2.2.1 To provide some scene setting context, a very high-level overview of the corridor, by mode, is provided here, before the more detailed problems are discussed.

Walking and Cycling

2.2.2 Varying levels of walking and cycling infrastructure are provided along the corridor and in many instances there are sections of shared-use footway immediately adjacent to the dual

carriageway, or, between Craibstone and Kintore, no provision for active travel along the route. However, to provide an overall indication of how current cycling routes are used within the study area, cycling 'heat maps' from Strava Metro are presented here. These Strava Heat Maps provide an indication of the comparative use of routes within the study area. The darker purple lines in the following figures indicate a higher volume of use by cyclists, with the lighter lines indicating less use. **Note that a**ll Strava Metro **data within this report is aggregated and de-identified data from Strava Metro.**

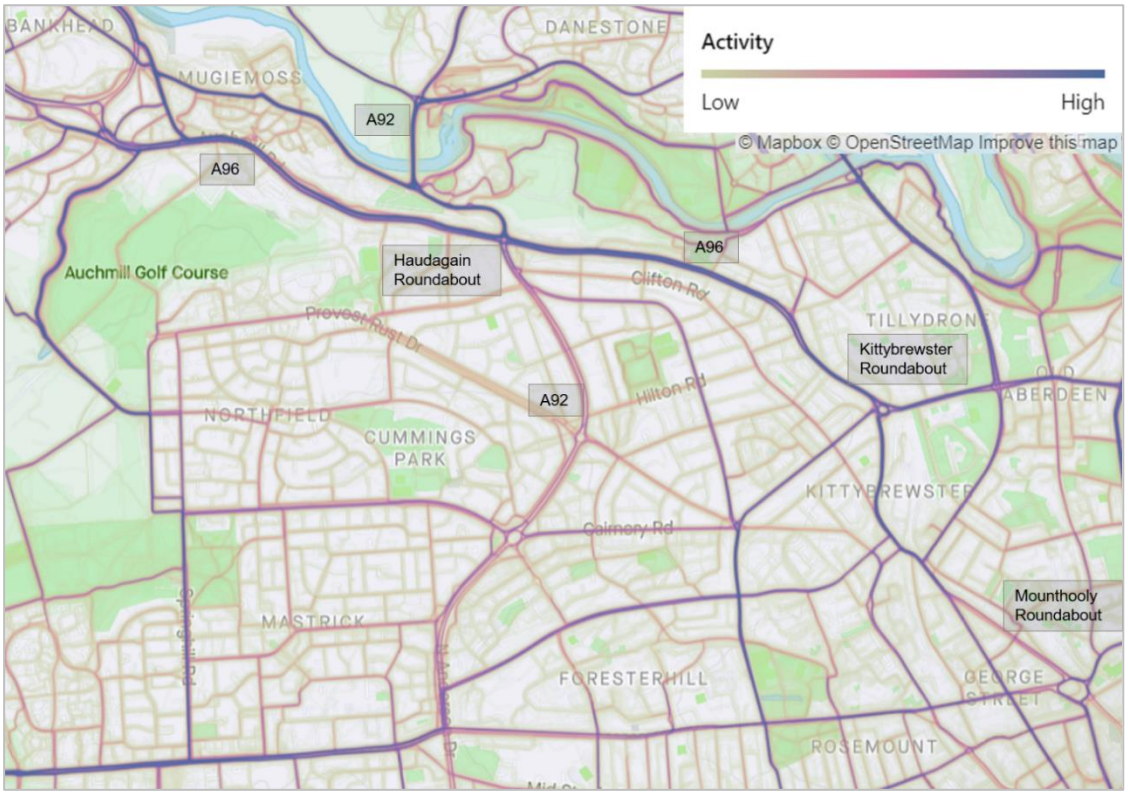


Figure 2.1: Strava Metro Heat Map – Aberdeen City[3]

[3] Strava Metro [Strava Metro | Map]

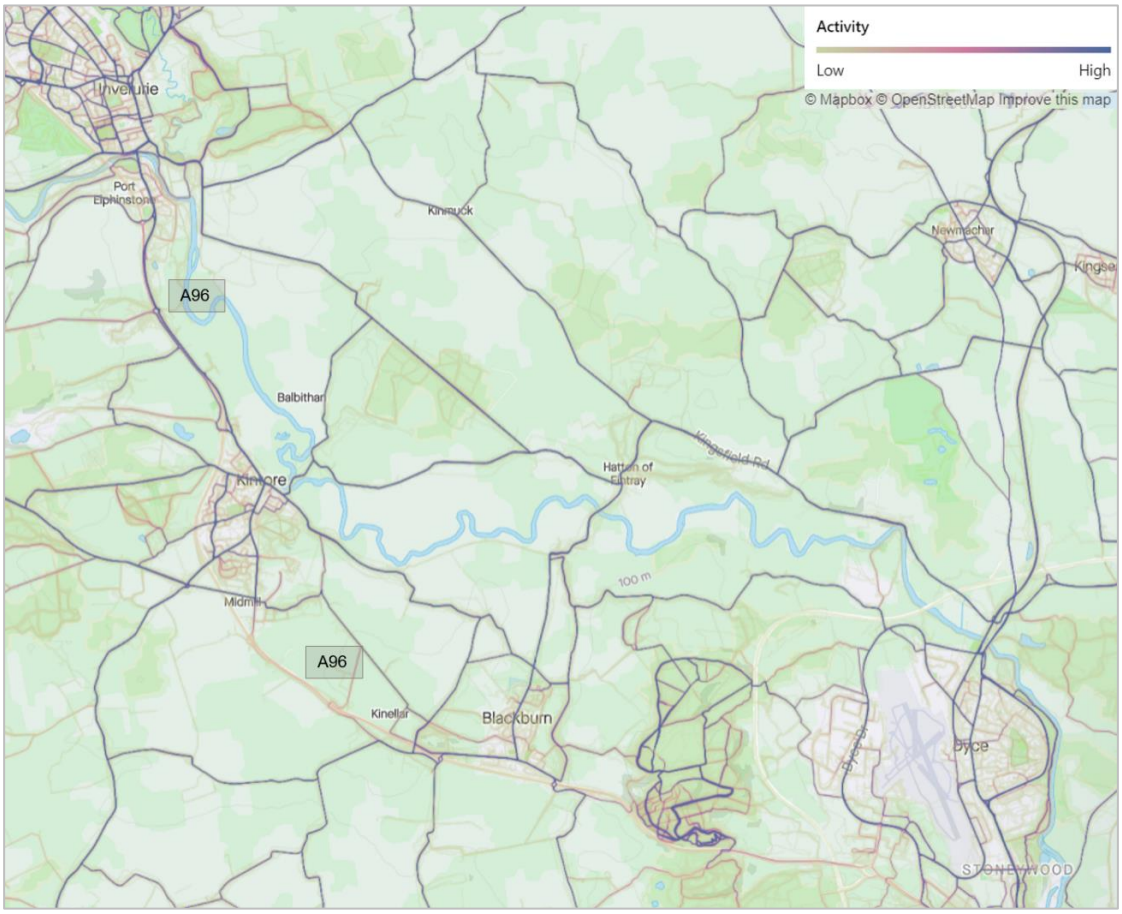


Figure 2.2: Strava Metro Heat Map – Dyce / Aberdeenshire[3]

Bus Routes

Current bus services (as at March 2021) provided by the main operators, First (in Aberdeen) and Stagecoach (in Aberdeenshire) are presented in Figure 2.3 and Figure 2.4.

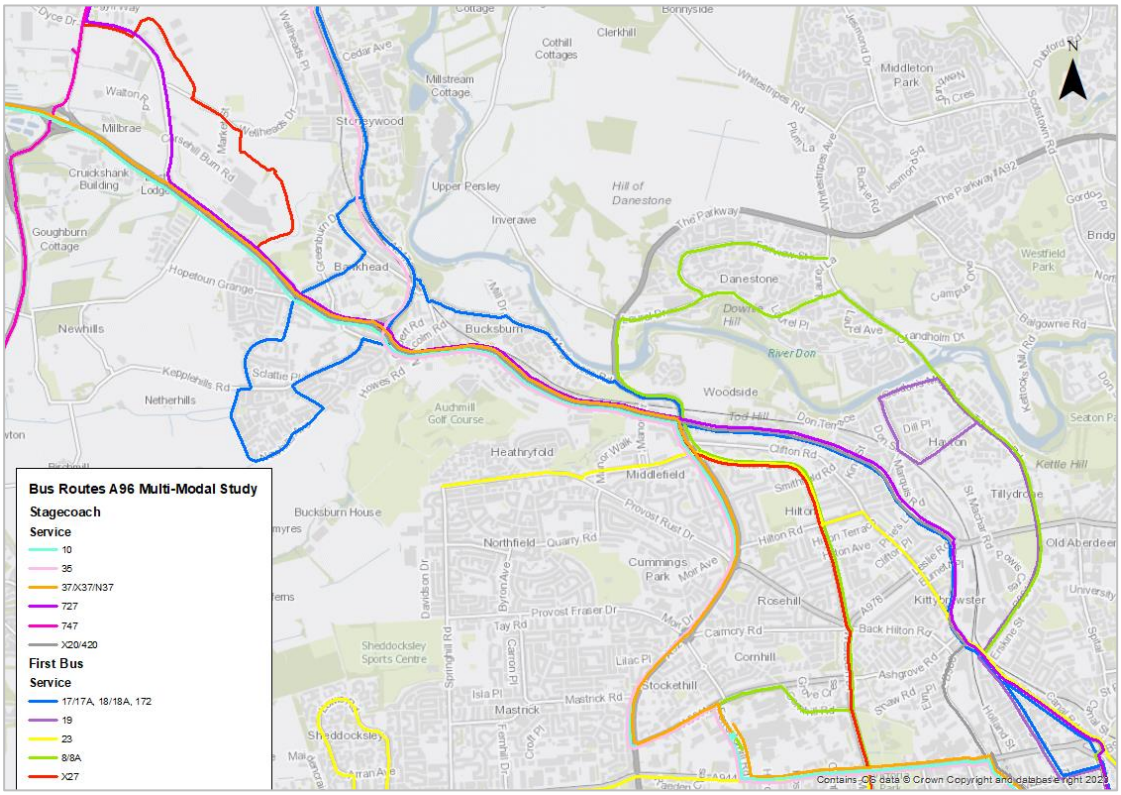


Figure 2.3: Current Bus Provision – Aberdeen

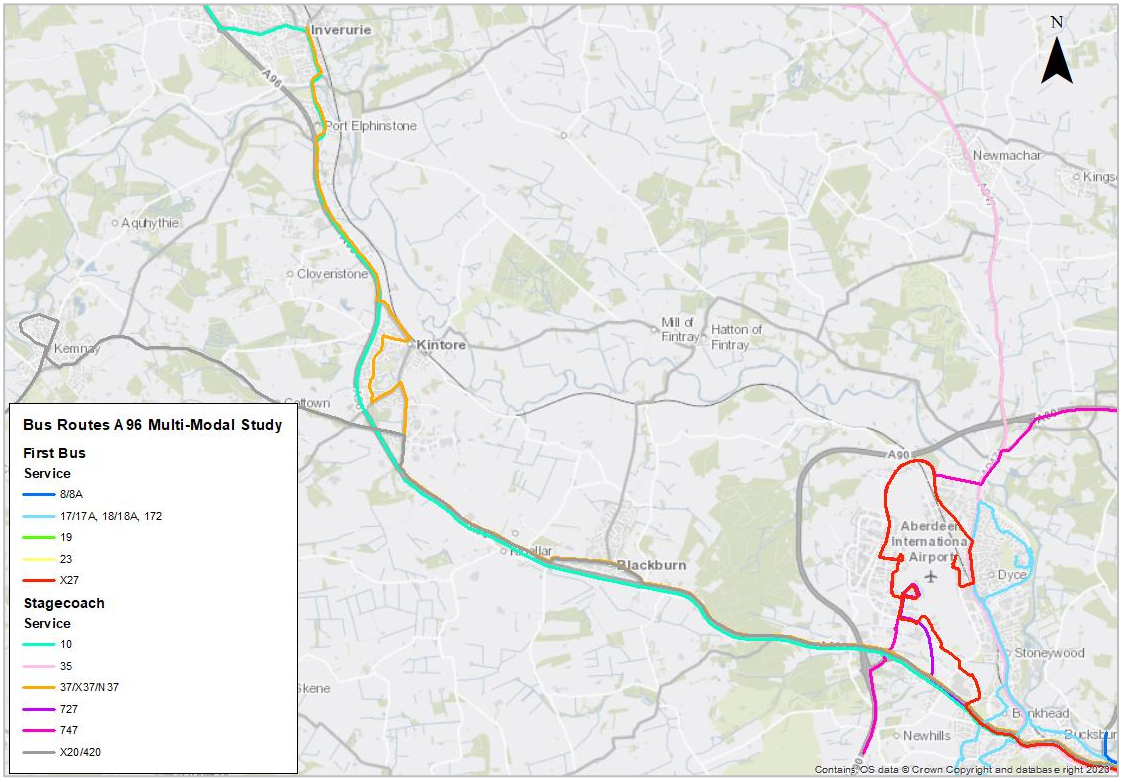


Figure 2.4: Current Bus Provision – Aberdeenshire

Traffic Volumes

2.2.3 To provide an appreciation of pre-COVID (but post AWPR) traffic levels along the corridor, annual average daily traffic flow (AADF) data has been plotted and is presented in Figure 2.5

2.2.4 In addition, analysis of traffic flow on Auchmill Road pre and post AWPR opening is presented in Figure 2.6.

2.2.5 The flow data indicates the marked (approximately 50%) decrease in traffic on the A96 east of Haudagain roundabout, reducing from around 40,000 AADF to around 20,000 AADF. Traffic reduces further as the A96 routes into Aberdeen centre, reducing to around 13,000 AADF on Powis Place.

2.2.6 Traffic data for Auchmill Road, as presented in *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note, Stantec, May 2021,* indicates that traffic on this section has reduced since the full opening of the AWPR (in 2019). The largest reduction is noted in the Westbound direction in the AM and Inter Peak periods on each of the days analysed. A comparison of the AADF contained in Figure 2.6 illustrates that across the days, traffic volumes have reduced between 6% and 13%.

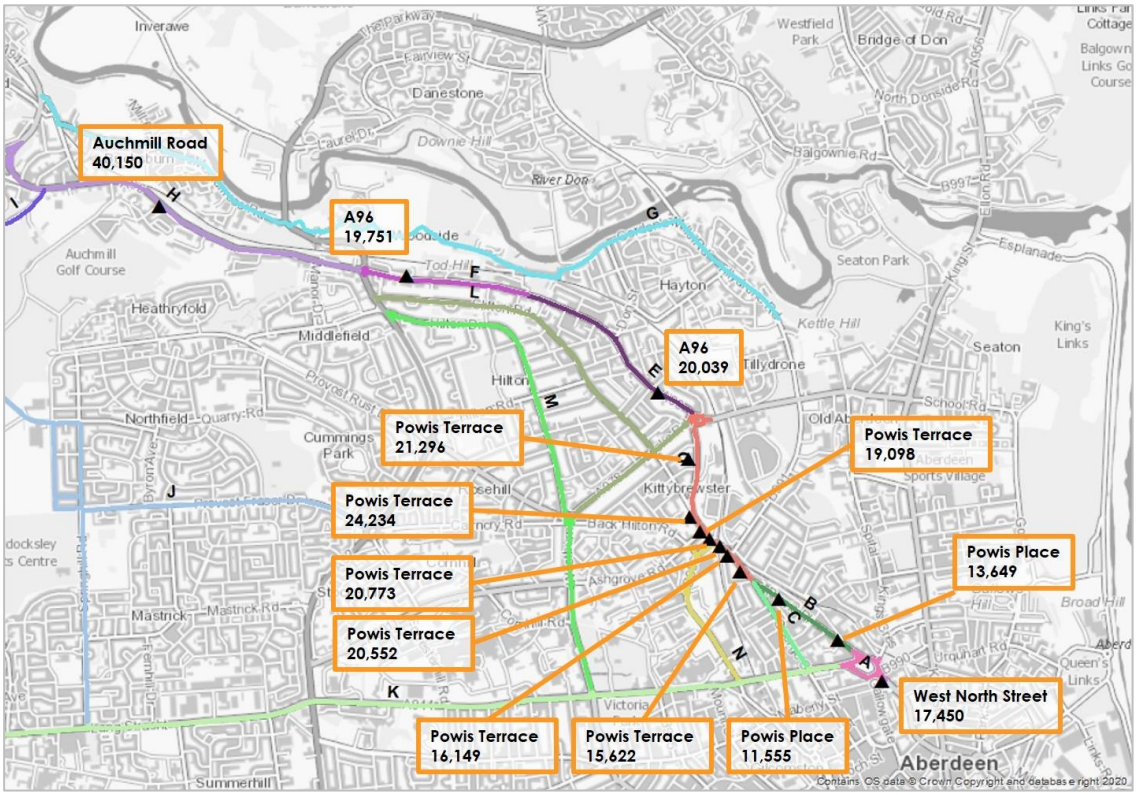


Figure 2.5: 2019 Average Daily Traffic Flow on A96 (Mounthooly to A947)[4]

[4] Based on data received from Aberdeen City Council

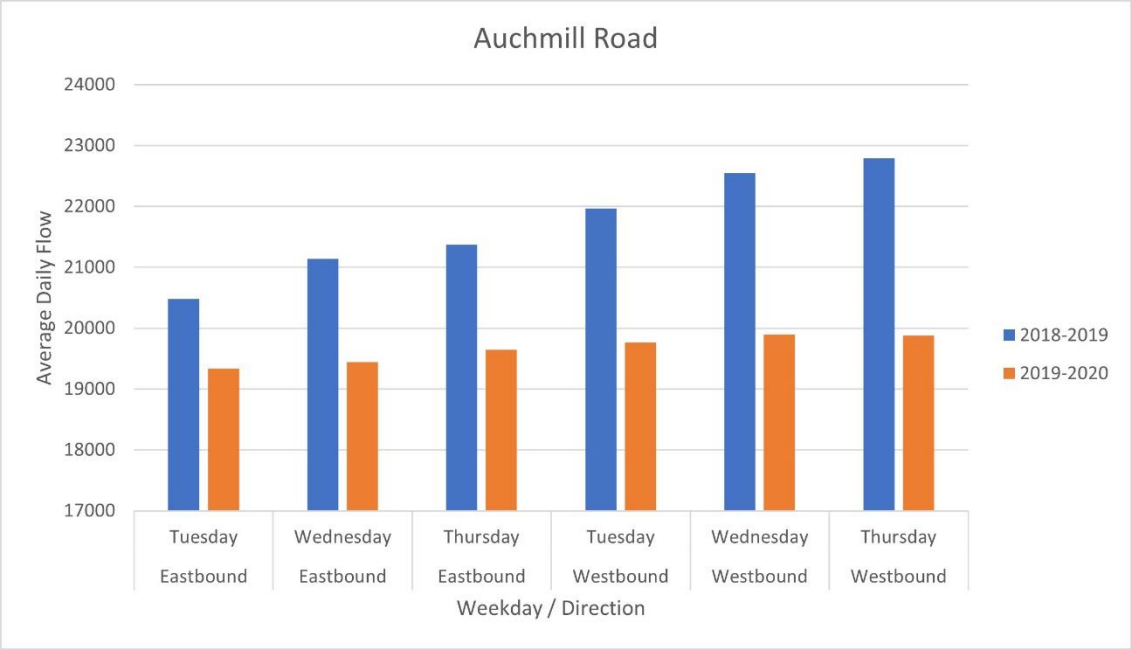


Figure 2.6: 2017 vs 2019 Auchmill Average Daily Traffic Flow (pre and post AWPR)[5]

Traffic and Transport

2.2.7 A number of existing studies provide useful background data on traffic and transport relevant to the corridor. In particular, the *A96 Collective Travel Study* provides a wealth of relevant data. The following key points are noted from previous studies, supplemented with some key findings from additional analysis undertaken (discussed in *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note, Stantec, May 2021*):

- The A96 (Inverurie to Aberdeen) has an approximate HGV proportion of 5.6% (but rising to 12% over certain sections of the road), with cars/taxis accounting for 80% of all vehicles
- Journey times along the corridor between Aberdeen and Inverurie can vary by up to 20 minutes at peak times (worst in the PM peak westbound direction)
- High car ownership in settlements on the A96 route (compared to within Aberdeen City)
- Traffic volumes gradually increase from the north-western extent of the study area, towards Aberdeen City
- In terms of Single Occupancy Vehicles (SOVs), the proportion of SOVs observed during surveys undertaken in November 2017 showed this ranges from almost 90% SOVs observed at Port Elphinstone during the AM peak to just under 65% during the Inter-Peak at Dyce Drive and Causewayend
- Variation in modal share of journey to work along the corridor e.g., 86% in Kintore use car compared to 41% in City Centre West area
- Rail Station car parks above 100% utilisation at Dyce and Inverurie. (Note that Kintore station was not open at the time of the *A96 Collective Travel Study)*
- Analysis of travel time and cost showed that rail offers a competitive alternative to the private car travel

[5] Drakewell Data

- Craibstone Park & Ride (P&R), 1000 spaces and low utilisation (approximately 1%) – and no direct links to major employment centres at Bridge of Don, Kingswells or Altens

- Bus occupancy levels on the Corridor were low, particularly for City Services, although average occupancy of Inter-Urban Services i.e., those travelling from a destination outwith Aberdeen City, was considerably higher at around 42%

- Analysis of travel time and cost showed that bus journey times are substantially longer than the quickest car-based journey, though competitive during peak congestion periods. Bus journey times are almost twice as long as rail (where travel by rail is an option).

- Bike parking is provided at each of the rail stations along the corridor (Aberdeen, Dyce, Kintore and Inverurie)

- Travel to work data (2001 Census) indicates, when the Study Corridor is taken as a whole, 60% of people travel to work drive a car/van. The second most popular mode of travel was by foot (15%). These figures represent a lower proportion of car drivers than the national average and a higher proportion of people on foot than the national average. However, there are differences in travel to work mode split in different residential areas on the Corridor:

    - Kintore for instance, 86% of people who travel to a place of work do so as a car driver, whereas only 1% travel by foot. In comparison, 41% of those who travel to work from City Centre West do so as a car driver, with 26% doing so by foot

    - Considering the study area as a whole, bus use is above both the national, Aberdeen City and Aberdeenshire averages

- Driving a car/van is the most popular mode of travel for journeys greater than 2.5km on the corridor. For journeys shorter than this, travel by foot is the most popular choice (64% for trips less than 1km and 48% for trips between 1km and 2.5km)

- Between 2012 and 2016, (and similarly between 2015 and 2019 in the new data analysed), the greatest number of accidents on the corridor during the period were rated as slight, although there has been a decline in the number of slight accidents since 2012. There are certain accident clusters noted: around Mounthooly roundabout; close to the junction of the A96 at the Powis Terrace junction with Leslie Road and Belmont Road; just south of the A96/A947 roundabout in the vicinity of the A96 / Inverurie Road junction; immediately south of Haudagain roundabout on the A90; and on the A96 at Broomhill Roundabout to the south of Kintore

- Bucksburn / Dyce zones are the biggest employment trip attractors on the corridor

Socioeconomics

2.2.8 Similarly, a number of existing studies provide useful socio-economic data relevant to the corridor. In particular the *A96 Collective Travel Study* provides a wealth of relevant socio-economic data. Given the extent of the data already analysed, and to ensure a proportionate approach to the study, no further analysis has been undertaken and the following key points are noted from previous studies:

- Parts of the Corridor are ranked amongst the most deprived areas in Scotland, namely around Port Elphinstone (Inverurie) and parts of Aberdeen

- On the whole, the majority of data zones on the Corridor fall within the 6th decile or higher, indicating that the study corridor as a whole area is relatively affluent

- SIMD data specific to accessibility shows that data zones within Aberdeen City score highly, as do those data zones within settlements such as Inverurie and Oldmeldrum in terms of accessibility. Conversely, surrounding rural areas perform less well

- The study area corridor has a lower level of car ownership than Scotland, Aberdeenshire, and Aberdeen City as a whole

- Level of car ownership varies considerably along the settlements on the Corridor however with households in commuter towns such as Kintore and Blackburn unsurprisingly having significantly higher proportions of car ownership than those based in the city centre

2.3 Problems

2.3.1 In order to guide the study, both in terms of data analysis, targeted engagement questions, the site visits and defining problems and opportunities for the corridor, the study area has been segmented into 25 sections as shown in Figure 2.7 and Figure 2.8, and detailed in Table 2.1.

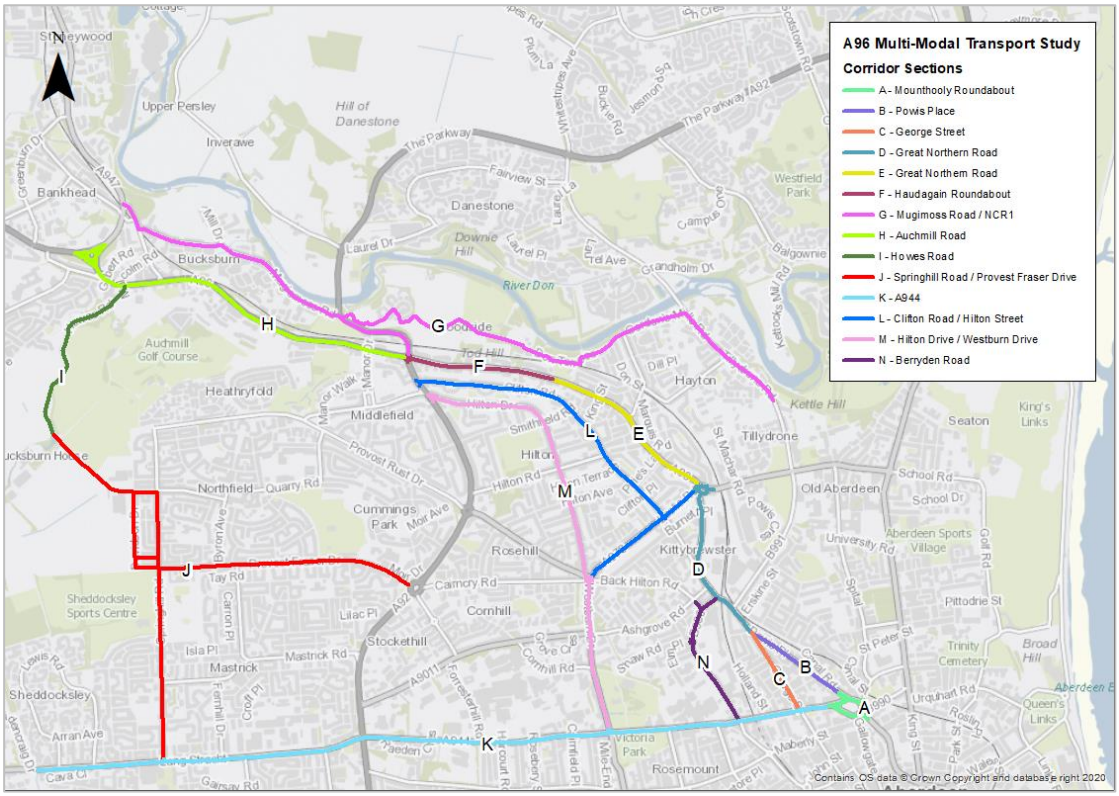


Figure 2.7: Corridor Map of Sections – Aberdeen City

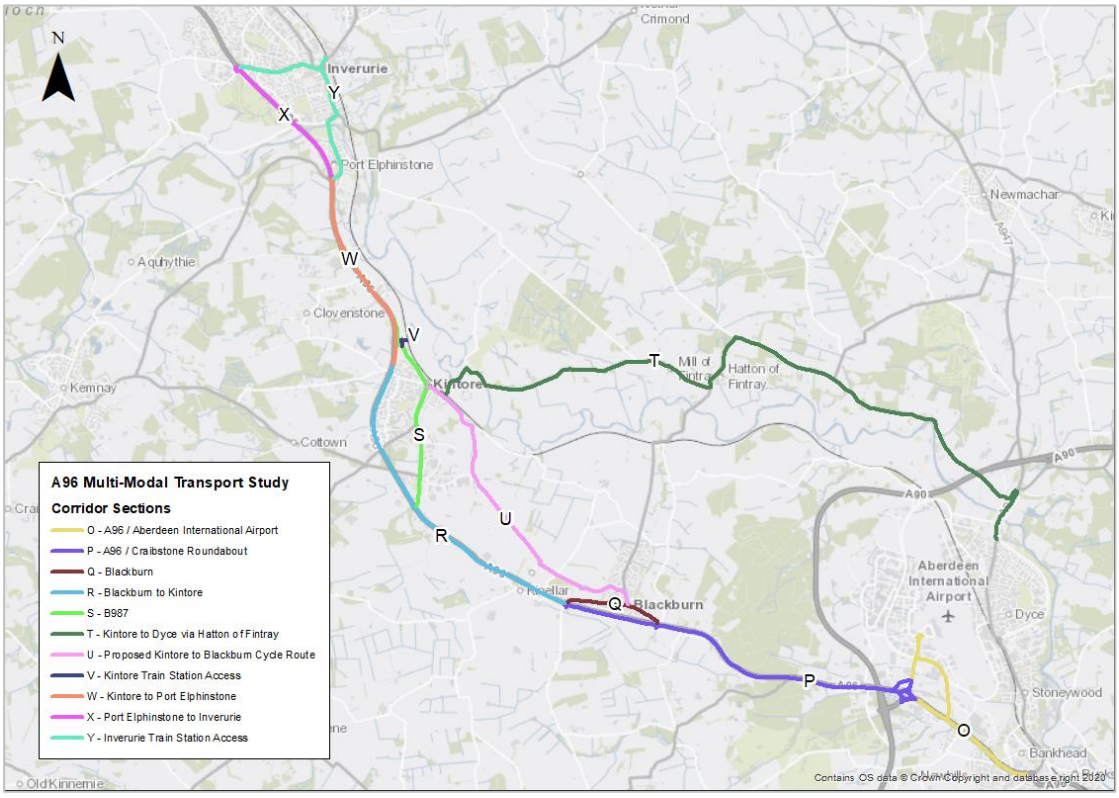


Figure 2.8: Corridor Map of Sections – Aberdeenshire

Table 2.1: Corridor Sections

Section	Location	Representation
A	Mounthooly Roundabout	Approach arms and circulating roundabout
B	Powis Place	Between Mounthooly Roundabout and George Street
C	George Street	Between Hutcheon Street and Powis Place
D	A96 Great Northern Road	Between George Street and St Machar Roundabout
E	A96 Great Northern Road	Between Station Road and St Machar Roundabout
F	A96 Great Northern Road / Haudagain Roundabout	Between Station Road and Haudagain Roundabout
G	Muggiemoss / NCR 1	Between Tillydrone Road/Avenue and A947
H	Auchmill Road	Between Haudagain Roundabout and Bucksburn Roundabout
I	Howes Road	Between A96 and Cycle gate
J	Springhill Road / Provost Fraser Drive	Between North Anderson Drive / Springhill Road and Cycle gate
K	A944	Between Maidencraig Drive and Mounthooly Roundabout
L	Clifton Road / Hilton Street	Between North Anderson Drive, Six Road Roundabout and St Machar Roundabout
M	Hilton Drive / Westburn Drive	Between North Anderson Drive and A944
N	Berryden Road	Between A96, Ashgrove Road and A944
O	A96 / Aberdeen International Airport	A96 between Bucksburn Roundabout and TECA / Airport
P	Craibstone Roundabout / A96	Between Craibstone Roundabout and Kinellar Roundabout
Q	Blackburn	Between Kinellar Roundabout and Clinterty Roundabout
R	Blackburn to Kintore	Between Kinellar Roundabout and Forrest Road Overbridge
S	B987	Between Broomhill Roundabout and A96 North Roundabout

Section	Location	Representation
T	Kintore to Dyce via Hatton of Fintray	B977
U	Proposed Kintore to Blackburn Cycle Route	Kintore to Blackburn
V	Kintore Train Station Access	Link to B987 and Kintore railway station
W	Kintore to Port Elphinstone	Between Elphinstone Roundabout and Forrest Road Overbridge
X	Inverurie to Port Elphinstone	Between Elphinstone Roundabout and Blackhall Road Roundabout
Y	Inverurie Train Station Access	Link to Inverurie railway station

2.3.2 The emerging problems along the A96 corridor (as presented below) were drawn:

- From the review of existing studies and available data (presented in Appendix A of the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note*)
- From further supporting data analysis (presented in Appendix B of the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note)*
- From the site visit findings (as presented in Appendix D of the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note)*
- From the engagement undertaken (as summarised in Appendix E of the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note)*

2.3.3 Specific problems were identified by mode on a section-by-section basis for each of the sections as shown in Figure 2.7 and Figure 2.8. For each of the problems identified, a description of the problem alongside an outline of the supporting evidence, plus source, was collated and is presented in Table 2.1 in the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note.*

2.3.4 These section-by-section problems then formed the basis of the development of the overarching transport problems from the perspective of a user of the transport system.

2.3.5 STAG recommends that transport problems are considered together with their *root causes* and *consequences*. These transport problems should also be clearly linked to the Transport Planning Objectives (TPOs).

2.3.6 Having set out the detailed problems associated with each section of the corridor (as presented in presented in Table 2.1 in *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note)*, Table 2.2 below consolidates these problems into 19 overarching transport problems from the perspective of a user of the transport system. For each transport problem, a set of supply side *root causes* has been identified. These root causes will be used in subsequent option generation, clearly linking the transport problem to the supply side root cause to the option. The *consequences* of these problems in terms of travel behaviour and societal impacts are then set out in each case to capture the full logic trail.

Table 2.2: Corridor Wide Problems – Summary

Transport problem (from a user's perspective)		Supply side root cause of transport problem	Travel consequence	Societal consequences
Walking and Wheeling				
1	The local environment provides low amenity or unsatisfactory conditions for walking and wheeling	- Width and condition of footways, dropped kerbs / tactile paving - Shared use with cyclists - Lack of infrastructure to support the visually impaired, such as tactile paving - Absence of footways / tactile paving - Severance of communities - Perceptions of personal security - Perceptions of safety – proximity of traffic - Wide entry flares on side roads - Parking on footways - Other on-street obstacles such as bins and bus shelters	- People make very short car trips instead - Some people may have difficulty accessing local shops and services and the public transport network - People make fewer local trips	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Reduced levels of physical activity leading to negative health outcomes - Social isolation and knock-on effects of this for some - Road accidents involving pedestrians with health and economic implications
2	Walking and wheeling routes can be indirect compared to crow-fly and can be disjointed / severed	- Use of pedestrian guard rails creates indirect routeing - Road layout and junction sizes - Lack of, or quality of pedestrian crossing facilities – e.g., two-stage, green times etc. - Width of, and traffic volumes / speeds on A96 in places creates severance	- People make very short car trips	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Reduced levels of physical activity leading to negative health outcomes - Road accidents involving pedestrians with health and economic implications

Transport problem (from a user's perspective)		Supply side root cause of transport problem	Travel consequence	Societal consequences
Cycling				
3	Cycling journeys on designated routes are fragmented and inconvenient	- Level of provision varies along corridor - Level of provision along the corridor falls short of modern standards and quality - There are a number of roundabouts on the corridor which are less safe for cyclists - 'Advisory' cycle lanes only - Parking in cycleways - Risks from left-turning vehicles - Poor road surfacing and potholes - Ineffective toucan crossings - Indirect routeing	- People continue to cycle but in sub-optimal conditions affecting journey quality - People drive rather than cycle - People use the bus rather than cycle	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Road accidents involving cyclists with health and economic implications - Reduced levels of physical activity leading to negative health outcomes
4	There are safety concerns around cycling in the corridor which prevent people from cycling	- Lack of segregated provision for cyclists - Intimidation by other road users - Speed limits	- People do not cycle for leisure - People drive rather than cycle for day-to-day trips - People use the bus rather than cycle for day-to-day trips	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Reduced levels of physical activity leading to negative health outcomes
Bus				
5	Bus services in the corridor are perceived to be of poor quality / poor value for money	- Quality of vehicles and onboard facilities - Service frequency - Reliability of services - Cost of services	- People drive instead - People do not make trips	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - People miss out on life opportunities
6	Many bus stops do not provide a high quality, comfortable and informed waiting environment	- Lack of / quality of shelters - Lack of at-stop bus timetable and real time information	- People drive instead - People use the bus less often – e.g., in poor weather	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc)
7	The bus network in the corridor is focussed on Aberdeen city centre	- Bus services are mainly radial in nature - No direct services to Aberdeen Airport from outside the city - Limited services accessing ARI	- People still travel by bus, but journey times are extended if travelling to other parts of the city due to the need to interchange - People drive instead - People cycle instead	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Lost productive time - Increased physical activity and improved health outcomes

Transport problem (from a user's perspective)		Supply side root cause of transport problem	Travel consequence	Societal consequences
8	Access to bus services can be restrictive	- Limited on-bus space for wheelchairs - Issues with access routes to stops, facilities at stops, interchange etc	- People drive instead - People do not travel	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Social isolation and knock-on impacts of this - People miss out on life opportunities
9	P&R options are in practice limited to Inverurie and Kintore	- Craibstone P&R site is not an attractive travel option - Lack of bespoke, branded express service - Limited range of destinations without interchange - Low service frequency - Lack of bus priority on route into city - Perceptions of lack of vehicle security - Lack of information on payment methods and permitted length of stay - Height restrictions at car park - [*Use of car park for other purposes*]	- Craibstone is used by very few people - Any P&R activity is focussed on railway stations or informal on-street parking	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Nuisance parking associated with informal P&R
10	Bus journey times are long, particularly compared with private car and rail	- Buses get caught up in general traffic - Stopping patterns / number of bus stops - Signal timings at key junctions - Absence of bus priority at congestion hotspots / key junctions - Hours of operation of bus lanes	- People drive instead - People still travel by bus but are frustrated by journey length - People cycle instead - People do not travel	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Lost productive time - Increased physical activity and improved health outcomes - People miss out on life opportunities
11	Bus journey times can be unreliable or are perceived to be unreliable	- Buses get caught up in general traffic due to lack of bus priority - Lack of enforcement of misuse of bus lanes and parking in bus lanes - Absence of bus priority at congestion hotspots	- People drive instead - People still travel by bus but are frustrated by lack of certainty - People cycle instead	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Lost productive time - Missed appointments - Increased physical activity and improved health outcomes -

Transport problem (from a user's perspective)		Supply side root cause of transport problem	Travel consequence	Societal consequences
12	Long bus journey times between Dyce Station and Aberdeen Airport	- Circuitous and infrequent bus connection between station and airport	- Many travel to the airport by taxi rather than by bus	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc)
13	High cost (or perceived cost) of bus (relative to income)	- Cost of bus fares - Lack of knowledge of bus fares, e.g., Grasshopper tickets	- Journeys are not made - Journeys continue to be made - People cycle instead	- People miss out on life opportunities - Disproportionate impact on disposable income contributes to deprivation and inequality - Increased physical activity and improved health outcomes
14	High cost (or perceived cost) of bus (relative to car ownership and usage)	- Cost of bus fares - Lack of knowledge of bus fares, e.g., Grasshopper tickets - Low cost and availability of parking in Aberdeen	- People drive rather than take the bus	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - 'Forced' car ownership
Rail				
15	Station car parks at Dyce and Inverurie are often full	- Imbalance between supply and demand during peak periods - Misuse of station car parks by other users - Quality of active travel connections to these stations - Absence / quality of bus connections to these station	- Missed trains - Longer car trips are made to access rail - People drive for their full journey - People travel by bus instead taking longer	- Missed appointments - Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Lost productive time

Transport problem (from a user's perspective)		Supply side root cause of transport problem	Travel consequence	Societal consequences
16	It is not always possible to get a seat on peak hour rail services	- Imbalance between supply and demand during peak periods	- People drive all the way to their destinations - People travel by bus instead taking longer - Some people may not travel at all	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Lost productive time - People miss out on life opportunities
17	It is not always possible to access the rail network by bus around Aberdeenshire	- Absence of timely bus connectivity to Inverurie and Kintore stations from surrounding settlements	- People drive to the stations - People drive all the way to their destinations	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc) - Cost implications of higher rates of household car ownership for station access
Car / Commercial vehicles				
18	Car and commercial vehicle-based journey times are extended and unreliable during peak periods due to congestion	- Imbalance between supply and demand during peak periods at junctions in the corridor[6] - Cost and availability of parking in city centre drives car use - High levels of household car availability	- Some may switch to rail, bus less likely as journey times would be similarly affected	- Missed appointments - Lost productive time - Additional emissions - Impact on local amenity due to queuing traffic
19	Using an EV is not always possible	- Lack of EV charging infrastructure	- Petrol / diesel vehicle used instead - Inconvenience if a charge has to be found 'off route'	- Avoidable car km with associated impacts (energy usage, emissions, congestion, collisions, noise etc)

[6] Note Haudagain and Berryden corridor improvements

2.4 Opportunities

2.4.1 A less structured approach has been used to describe opportunities which tend to have less defined causes and variable consequences depending on action taken.

2.4.2 Recent changes across the policy landscape, most notably around climate change present decision makers with the rationale and justification to implement the supporting changes and behavioural change catalysts required in the transport system.

2.4.3 The publication of the Scottish Government's updated ***Climate Change Plan*** in 2020 set out revised climate change targets including: reducing car kilometres by 20% by 2030; phasing out petrol and diesel vehicles; and supporting all transformational active travel projects. Furthermore, the *Reducing car use for a healthier, fairer and greener Scotland* (2022) publication outlines the route map to achieving the 20% reduction in car kilometres by 2030 and describes the key sustainable travel behaviours which make up the framework, including investing in the public transport network.

2.4.4 Transport Scotland's ***Scotland Transport Projects Review 2*** (STPR2) draft was published in January 2022 and includes a recommendation (recommendation 13) for continued partnership working with local partners in developing plans for a bus based rapid transit system for Aberdeen (of which the A96 is identified as a key route within the system). The document notes the project would support all five of the key STPR objectives of: net zero emissions; affordable and accessible public transport; places, health and wellbeing; sustainable inclusive growth; and increasing safety and resilience in the transport system.

2.4.5 Transport Scotland's ***Reducing car use for a healthier, fairer and greener Scotland*** publication and STPR2 are both underpinned by and reflect Scotland's National Transport Strategy 2. Within NTS2 are the 'Sustainable Travel Hierarchy' and 'Sustainable Investment Hierarchy', which together guide decision making by promoting walking, wheeling, cycling, public transport and shared transport options in preference to single occupancy private cars. This strong underpinning policy context offers fresh opportunities for successfully developing and implementing sustainable transport schemes.

2.4.6 The **Transport (Scotland) Act 2019** provides Local Authorities with the powers to implement a workplace parking license scheme and Low Emission Zone (LEZ). Such complementary demand management measures are likely to encourage the uptake of sustainable modes and support the success of sustainable transport schemes.

2.4.7 The **completion of the AWPR**, funded by Transport Scotland and the local authorities, has enabled traffic to route around Aberdeen city and avoid passing through it. This has provided the opportunity to reassess the roads hierarchy within the city, prioritise sustainable transport infrastructure and facilities on routes into the centre and bring forward the City Centre Masterplan schemes.

2.4.8 The A96 corridor has **key residential and employment trip generators and attractors** and, together with the planned future development along the corridor (predominantly around Dyce / Craibstone – both north and south of the A96 carriageway), represent a strong transport demand market. This offers the opportunity to provide successful sustainable infrastructure and services to facilitate behavioural change. In addition, tourism numbers to the region are growing every year with attractions such as TECA generating increased visitor numbers on the corridor. This presents further opportunity to capture this demand onto sustainable travel modes.

2.4.9 The **underutilised Park & Ride** site at Craibstone offers a 'ready-made' opportunity to support a shift bus travel, if the appropriate level of services, competitiveness and journey quality could be achieved. Given the A96 is dual carriageway over almost the entire length

from Inverurie to Mounthooly there is ample opportunity for road space reallocation, without the need for banned general traffic movements or significant third-party land costs.

2.4.10 Bus operators have been investing in new vehicles and 'fuelling' infrastructure, utilising both electric and hydrogen-based technologies. Such vehicles offer both environmental benefit and will help to improve perceptions of bus travel. The opportunity to capitalise on these investments is important in the development of a bus priority schemes for the A96.

2.4.11 Further specific opportunities, and greater detail around some of the opportunities listed above, are discussed in the table below.

Table 2.3: Opportunities

Opportunity	Description
Berryden Corridor Improvement: Corridor will include segregated provision for walking and cycling	The Berryden Corridor Improvement Project (BCIP) involves widening the existing road and junction improvements between Skene Square and Ashgrove Road and constructing a new section of road between Ashgrove Road and Kittybrewster roundabout. The project will provide substantial benefits across the north of the city and beyond including: • Improved journey times and connections. • Reduced congestion. • Improved pedestrian and cycle provision. It will also build on the benefits gained from the opening of Diamond Bridge further improving connections within the city.
Workplace Parking Levy: Transport (Scotland) Act 2019	Provides powers for local authorities to implement a parking levy which can help encourage uptake in sustainable modes of travel.
Inverurie Integrated travel Town, Masterplan Document	Action plan document with opportunities to tie-in with study outcomes.
Similar sustainable transport studies for A90 (Ellon to Garthdee), A944 / B9119 (Westhill to Aberdeen city centre), A947 and A92	Opportunities to tie-in with study outcomes.
A96 Dualling Programme	Transport Scotland's dualling programme for the A96 between Inverurie and Nairn will have implications on how people access the study area. There are potential opportunities as part of this study to consider junction updates on the A96 between Inverurie and Aberdeen as well as how active travel infrastructure west of Inverurie can tie in with new provision as part of the dualling.
Low Emissions Zone: Aberdeen LEZ would increase the case for investing in the delivery of sustainable transport connecting to the city centre	Aberdeen is also developing proposals for a city centre Low Emission Zone (LEZ) in line with the Scottish Government's Programme for Government. The LEZ will comprise an area where more highly polluting vehicle types will not be permitted. The introduction of a LEZ aids in improving air quality and possibly also reduce city centre vehicle volumes.
Aberdeen Roads Hierarchy: Provide policy	The Roads Hierarchy provides policy context for future transport planning in the City, ensuring traffic is directed onto the most appropriate route.

Opportunity	Description
context for future transport planning across the region	There is an expectation that benefits of the AWPR must be 'locked in' to prioritise the movement of active and sustainable travel through the re-allocation of carriageway space, junction capacity and other traffic management/prioritisation measures The Roads Hierarchy review considered the existing road network (all A, B and C-class roads as well as some unclassified roads) within the AWPR boundary and developed options for a revised classification comprising Priority, Secondary and Local routes. The hierarchy classifies the A96 (AWPR / Craibstone junction to Mounthooly Roundabout) as a Priority radial route.
Existing Active Travel Promotional Schemes	There are a number of existing schemes and campaigns which promote active travel in the region. These existing campaign/schemes can be used to raise awareness of improvements and encourage use of any new/improved infrastructure, and include: • Both councils participate in the Sustrans I-Bike project which aims to encourage cycling among staff and pupils. Similarly, Bikeability Scotland cycle training is offered at most primary schools across the region. • The Aberdeen City and Shire Getabout partnership runs events across the region and promotes healthy and sustainable transport choices. • Nestrans also runs a Sustainable Travel Grants scheme to support organisations across the regions who aim to develop Travel Plans and encourage sustainable travel awareness
Policy supports active travel improvements along the corridor	Local and regional policy documents support and propose active travel improvements to the study corridor. For example: • Aberdeen City and Shire Councils aim to support active travel via their Local Development Plans, and Local Transport Strategies, which are bolstered by the Aberdeen Active Travel Action Plan and Aberdeenshire Walking and Cycle Action Plan respectively. • The Nestrans Active Travel Action Plan defines the A96 corridor as a strategic active travel route (Strategic Route 4), with new infrastructure required to ensure provision for the needs of pedestrians and cyclists in the design of the A96 dualling scheme. It also notes a need for action to ensure Locking in the Benefits of AWPR for pedestrians and cyclists by providing cycling or pedestrian priority on routes experiencing a reduction in traffic as a result of new roads infrastructure (as may be the case on the A96 due to both the AWPR and the proposed Berryden Corridor scheme) • The Roads Hierarchy review identified the A96 as a priority radial corridor linking the AWPR to the city centre.
The Transport (Scotland) Act provides Local Authorities with new powers	The Transport (Scotland) Act provides local authorities with a variety of new/extended powers including the ability to provide bus services for social needs, enforce the national bans on pavement and double parking, and to implement a workplace parking levy and Low Emission Zones. The introduction of the Act provides an opportunity to generate income to make the transport network cleaner, smarter and more accessible and to potentially fund active travel and public transport improvements already outlined within the Local Transport Strategy.
National Transport Strategy 2 requires investment is in line with	In March 2020, the Scottish Government published the National Transport Strategy 2 (NTS2) which sets out the government's vision for the Scottish transport system over the next 20 years. This document replaces the 2006 National Transport Strategy and places a greater importance upon the role

Opportunity	Description
the Sustainable Transport Hierarchy	of transport in addressing both climate change and social inequity, for the purposes of improving quality of life at a national level. NTS2 requires that transport investment occurs in line with the Sustainable Transport Hierarchy and supports more radical measures such as demand management and reallocating road space to drive this change. Support from national government will empower local authorities to consider and deliver greater change to their own transport networks. Nestrans Regional Transport Strategy, RTS:2040, follows and expands upon the recommendations of NTS2.
Availability of External Funding Sources	A review of potential external funding sources for the A96 corridor has highlighted three potential avenues to help deliver low carbon, sustainable transport infrastructure on the corridor: • The Scottish Government's £500 million Bus Partnership Fund to improve bus priority infrastructure, tackle the impacts of congestion on bus services and increase bus patronage. • Sustrans Scotland additionally provide match funding to support the development of quality active travel infrastructure for Places for Everyone projects. • The Scottish Government is promoting the use of ultra-low emission vehicles (ULEVS) with the aim of phasing out the need for new petrol and diesel cars and vans by 2032 ahead of the UK Government's 2040 target. The Switched On Scotland Action Plan was published in 2017 and sets out how the Scottish Government aims to increase the purchase and use of electric vehicles by working with partners to deliver its actions to decrease costs, increase convenience, and change the culture. The Scottish Government is committed to taking a number of actions and will consider projects in the following areas: EV infrastructure; Electric A9; Low Carbon Transport Loan; Switched on Towns and Cities; Low Carbon Travel and Transport Challenge Fund; hydrogen fuel cells; and transport emissions in Scotland.
Transport Studies and Planned Improvements to Date	Both Councils and Nestrans have commissioned a number of studies which consider means to improve transport conditions within the study area, including the Aberdeen City Centre Masterplan, Roads Hierarchy Study, Aberdeen City Region Transport Appraisal, Aberdeen Sustainable Urban Mobility Plan, Cross City Transport Connections Study, A96 Collective Travel Study, Berryden Corridor Improvements, and the Kintore to Blackburn Cycle Route – Option 3 Detailed. These studies have generated a number of suggested interventions of varying scope/scale. The Aberdeen City Centre Masterplan and Road Hierarchy documents are of particular importance as they propose significant changes to how people travel to and through Aberdeen City Centre: • The City Centre Masterplan (CCMP) provides a blueprint for transforming the city centre with the aim of delivering greater prosperity and a more enjoyable environment for users. The masterplan aims to reduce traffic congestion, improve air quality, and support active travel movements within the city centre to support the local economy and to deliver a step change in transport connectivity and accessibility for all. • The Roads Hierarchy aims to capitalise on the benefits of the AWPR, make best possible use of the city's road network, support the CCMP and reduce cross-city traffic movements. The document sets out a number of interventions to support the delivery of the new hierarchy.

Opportunity	Description
Existing Active Travel and Bus Priority Infrastructure	There is existing active travel and bus priority infrastructure along the study corridors, and while this infrastructure has deficiencies as discussed above, it provides a basis upon which to build improved solutions. This includes shared use facilities along sections of the A96 and existing bus lanes along the route. This study provides an opportunity to increase the density of the existing active travel and bus priority infrastructure along the corridor. There are particular opportunities related to new developments (both commercial and housing) along the (strategic growth) corridor, the Aberdeen City Centre Masterplan and through the formalisation and improvement of existing infrastructure that will improve accessibility to transport for all users and supporting a modal shift away from the private car
Aberdeen has an existing Smart Ticketing System	The GrassHOPPER smart ticketing scheme operates across Aberdeen City and Shire and has been adopted by 8 bus operators including Stagecoach and First Group. There is an opportunity to increase awareness and use of the GrassHOPPER Smart Ticketing System in Aberdeen. GrassHOPPER tickets are currently accepted on board services operated by nearly all major public transport operators in Aberdeen. The ticket is designed to make bus travel in the City and Shire more convenient.
Aberdeen Bike Hire scheme	Aberdeen's e-bike scheme, being developed, will see e-bikes installed at various locations around the city and offers an opportunity this study can support by providing the appropriate infrastructure to encourage up take of the hire bikes.
Trip Generators and Attractors are present along the corridor	The study area features attractors and generators of traffic along its length, including: • The communities of George Street, Kittybrewster, Tillydrone, Hilton, Woodside, Bucksburn, Dyce, Blackburn, Kintore and Inverurie • The principal destinations including: the city centre, Berryden Retail Park, Aberdeen University, North East Scotland College, Scotland's Rural College, Aberdeen international Airport, TECA, and Dyce. This generates bi-directional demand for travel during both peaks. In theory, this should support the viability of public transport services.
New Developments may support delivery of Transport Improvements	Aberdeen and Aberdeenshire Proposed Local Development Plan's (2020) identify a number of large development proposals along (or in close proximity) to the corridor. These include: Craibstone North and Walton Farm (19ha of employment), Craibstone South (1,000 houses), Davidson Papermill (30ha of mixed use development), Dyce Drive (66ha of employment), Grandhome (7000 new houses and 5ha employment), Greenferns Landward (1,500 houses), Rowett North (63ha employment), Rowett South (1940 houses) and Woodside (300 houses) within the Aberdeen boundary with further housing developments to the east of Blackburn (50 houses) and Kintore (over 1,000 houses), and north and south of Inverurie (over 2,000 houses), as well as employment land allocation to the south of Inverurie and Kintore. This extensive new development should facilitate improvements to public transport and active travel infrastructure via developer contributions and direct investment. At the same time, development will increase the customer base for existing public transport services and may support the introduction of higher frequencies and new services. Any new services which travel via Craibstone P&R site should increase the attractiveness of the P&R offering to all users.

Opportunity	Description
Road Width along the A96	While there are pinch points along the route (most notable at Powis Terrace where the road narrows over the railway bridge)), much of the A96 from Mounthooly Roundabout to Inverurie is dual carriageway, often with a central reserve. This provides greater flexibility to deliver transport improvements with higher potential to integrate both bus and active travel interventions.

3 Transport Planning Objectives

3.1 Introduction

3.1.1 STAG recommends that transport problems are considered together with their *root causes* and *consequences*. These transport problems should also be clearly linked to the Transport Planning Objectives (TPOs).

3.2 Objective Development Methodology

3.2.1 To provide a clear logic trail between problems and objectives, a TPO framework has been developed which has taken into account the problems (as defined in Table 2.2), objectives from previous studies (as collated in Appendix A of the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note),* and through a review of relevant policy (as presented in Appendix C of the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note).*

3.3 Emerging Transport Planning Objectives

3.3.1 The emerging TPOs aligned against the set of problems presented in Table 2.2 is presented in Table 3.1 below, with the table clearly showing:

- An initial ‘sub-objective’ considered in response to each of the individual problems
- Consolidation of these sub-objectives into seven draft TPOs
- For each TPO, a series of potential success measures of KPIs has been set out which can be used for both for ‘SMART-ening’ of the objectives and in the subsequent Monitoring & Evaluation plan

Table 3.1: Emerging Transport Planning Objectives and Measures for Monitoring and Evaluation

No.	Transport problem (from a user's perspective)	Study sub-objective	Draft TPO	Potential success measures for Monitoring & Evaluation and SMART-ening
1	The environment provides low amenity or unsatisfactory conditions for local **walking and wheeling**	Improve and maintain the quality of the pedestrian environment and address the barriers which affect some groups moving around when walking or wheeling	*TPO1: Improve the quality of the pedestrian experience, and address the barriers which affect people moving around as pedestrians along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre*	Local neighbourhood footfall, Travel diaries / surveys, Volume of short car trips, Perceptions of local environment (surveys), Desire line / actual route ratios at junction, Pedestrian accident rates, vehicle speeds
2	**Walking and wheeling** routes can be indirect compared to crow-fly and can be disjointed / severed	Improve the coherence and directness of walking routes in the corridor		
3	**Cycling** journeys on designated routes are fragmented and inconvenient	Improve journey quality, times and safety for cyclists along the transport corridors	*TPO2: Improve the quality of the cycling experience, and address the barriers which prevent many people cycling along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre*	Cycling volumes, number of KSI, perception (surveys), Travel diary, new cycling participation, screenline counts by mode in corridor, vehicle speeds
4	There are safety concerns around cycling in the corridor which prevent people from **cycling**	Address safety concerns to increase cycling participation in corridor		
5	**Bus services** in the corridor are perceived to be of poor quality / poor value for money	Improve the quality (real and perceived) of bus services in the corridor	*TPO3: Improve the quality of bus travel in the corridor for all users, enhancing the network and the travel experience both for current bus users and to attract new users*	Passenger satisfaction data / vehicle specs / passenger volumes / bus km, Create and maintain inventory of facilities at bus stops, Screenline counts by mode in corridor, bus patronage from Craibstone P&R with survey to determine previous travel behaviour
6	Many **bus stops** do not provide a high quality, comfortable and informed waiting environment	Improve the quality of bus stops and the facilities provided there		
7	The **bus network** in the corridor is focussed on Aberdeen city centre	Reduce the need for interchange when travelling from the corridor across the city		
8	Access to **bus services** can be restrictive	Improve access to public transport for those with impaired mobility / health		
9	**P&R** options are in practice limited to Inverurie and Kintore	Increase the use of P&R in the corridor as a substitute for car travel		
10	**Bus journey times** are long, particularly compared with private car and rail	Reduce journey times by bus, and narrow the gap between bus and car journey times	*TPO4: Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times*	Point to point JTs from timetables between key locations, Comparisons with INRIX general traffic data
11	**Bus journey times** can be unreliable or are perceived to be unreliable	Improve bus punctuality on services in the corridor		
12	Long **bus journey times** between Dyce Station and Aberdeen Airport	Improve connectivity between Dyce Station and Aberdeen Airport		
13	High **cost** (or perceived cost) of **bus** (relative to income)	Reduce the cost of public transport where this is a demonstrable deterrent to people travelling	*TPO5: Address the cost of bus travel (or the perception)*	public transport usage amongst lower income groups, Awareness of

No.	Transport problem (from a user's perspective)	Study sub-objective	Draft TPO	Potential success measures for Monitoring & Evaluation and SMART-ening
14	High **cost** (or perceived cost) of **bus** (relative to car ownership and usage)	Address the cost of public transport where this is a demonstrable deterrent to its use	*where this is a barrier to travel or a factor in car use*	fares (surveys), Labour market participation rates, Screenline counts by mode in corridor
15	**Station car parks** at Dyce and Inverurie are often full	Station car parking should be used efficiently, and 'genuine' park and ride travel is provided for	*TPO6: Improve active travel and bus travel integration with, and access to, rail services in the corridor*	Use of station car parks should minimise car kilometre and maximise rail revenue, Station access mode share, bus timetables, quantum of interchange opportunities (TRACC)
16	It is not always possible to get a seat on **peak hour rail** services	Seating capacity should not act as a constraint on rail travel in the corridor		
17	It is not always possible to access the **rail network** by bus around Aberdeenshire	Improve bus / rail interchange in the corridor		
18	**Car and commercial vehicle**-based journey times are extended and unreliable during peak periods due to congestion	Manage journey time for general traffic to prevent traffic re-routing in the corridor	*TPO7: Manage general traffic to minimise traffic re-routeing onto secondary and local routes as defined by the North East Roads Hierarchy*	Difference between peak and off-peak travel times (INRIX), Screenline counts by mode in corridor, monitoring of traffic in potential rat-runs

3.3.2 TPO5 in the table above is noted as '*Address the cost of bus travel (or the perception) where this is a barrier to travel or a factor in car use'.* While recognising that addressing the cost of bus travel (or the perception) is an issue, especially in terms of ensuring equality of access, bus fares are set by commercial operators and Aberdeen City Council and Aberdeenshire Council do not have control over this. The options being developed and appraised as part of this study will not be able to address this TPO or provide any benefit or disbenefit with regards to this TPO, with no discernible difference in the appraisal between any of the options. As such, the TPO has not been taken forward.

3.3.3 It is however recognised that the Councils can implement certain demand management measures in tandem with the options, which would deter people from using the car by increasing the cost of using the car relative to public transport and active travel. Such measures could include increasing car parking charges, congestion zone charging and workplace parking licenses. The implementation of such options is likely to increase the overall success of sustainable transport option implementation.

3.3.4 The resulting final six proposed TPOs are therefore as follows:

- **TPO 1** - Improve the quality of the pedestrian experience, and address the barriers which affect people moving around as pedestrians along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre
- **TPO 2** - Improve the quality of the cycling experience, and address the barriers which prevent many people cycling along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre
- **TPO 3** - Improve the quality of bus travel in the corridor for all users, enhancing the network and the travel experience both for current bus users and to attract new users
- **TPO 4** - Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times
- **TPO 5** - Improve active travel and bus travel integration with, and access to, rail services in the corridor
- **TPO 6** - Manage general traffic to minimise traffic re-routeing onto secondary and local routes as defined by the North East Roads Hierarchy

3.3.5 These TPOs reflect the range of things which the study is setting out to achieve across all modes of travel.

3.3.6 These TPOs were discussed, and agreed, with the client group at a workshop in August 2021.

4 Option Development

4.1 Introduction

4.1.1 The development of active travel and public transport options has been based on developing **transformational schemes** that can achieve the Transport Planning Objectives for the study, as set out in Table 3.1, and by doing so, address the issues identified along the corridor related to walking, cycling and bus use.

4.1.2 In line with the study brief, in order to develop truly transformation schemes and meet the ambitions of the study, an **end-to-end corridor-based approach** to option development was adopted, considering potential corridor length schemes between Inverurie and Mounthooly, and with each scheme incorporating both bus and active travel elements. Standalone junction or road section 'options' do not feature in the options developed but rather are incorporated into corridor wide options.

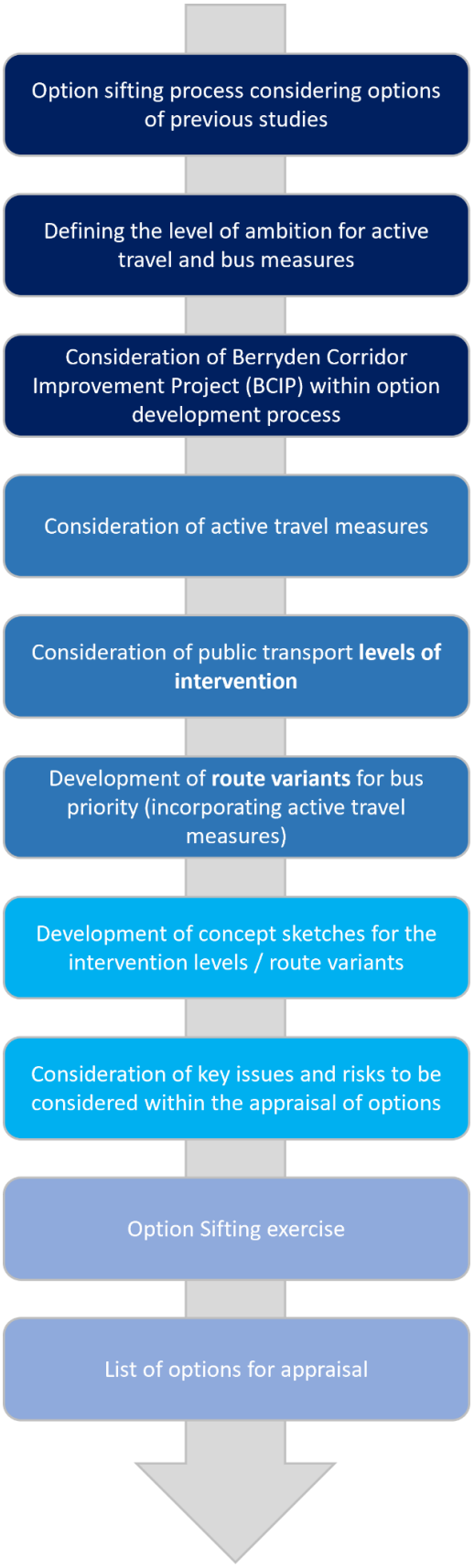
4.1.3 Of particular note has been the need to consider the Berryden Corridor Improvement Project (BCIP) being progressed by Aberdeen City Council. This scheme will deliver a new dual carriageway section linking Skene Square to the A96 at Kittybrewster Roundabout and making a substantial change to the road network. The BCIP presents several significant challenges and opportunities that need to be considered by this study. These are discussed within this report.

4.1.4 A separate technical report, *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022*, provides extensive detail on the option development process. This report should be read for greater insight into the option development work undertaken. The key option generation and development process and outcomes are consolidated within this chapter but the *A96 Multi-modal Transport Study - Option Development Report* provides further detail covering:

- **Design Objectives** – Guiding Principles and Level of Ambition
- **Bus Priority and Cycle Scheme Case studies** and key features and benefits of different approaches - to guide the development of the concept option designs along principles that are integral to other operational and viable schemes
- An **overview of the Design Process and the Key Issues** across sections of the corridor – including a description of the corridor segmentation; preparation of baseline plans; review of best practice guidance to understand the most suitable interventions; and from this the development of the concept plans. These concept plans were based on a desktop audit of the corridor, and review of the site audit material, that included road width measurements; establishing junction types and the method of control; the location of pedestrian crossing facilities and bus stops; and noting key design constraints such as pedestrian subways, road carriageway grade differences, new development sites.
- **Discussion on the development of options** ranging from 'Do Minimum' type interventions to transformational 'Do Gold' type interventions
- **Design Risks** – considering both design and construction risks and operational risks (and an associated Design Risk Register)
- **Details on junction design** for each option
- Presents **concept sketch plans** that show the extent of bus lane and cycle route infrastructure along the corridor for the options considered

- Presents **concept designs** that show the potential impact of new infrastructure on junction layouts, the highway boundary, on-street parking provision and highway structures such as pedestrian subways or railway bridges

4.1.5 The full option development process, encompassing the work as presented in the *A96 Multi-modal Transport Study - Option Development Report* is set out in the remainder of this chapter but follows the process as set out in the figure to the left.



4.2 Initial Option Sifting Process

4.2.1 Before any work was undertaken considering option generation, cognisance was taken of options which had been identified within previous studies.

4.2.2 The study's *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note, Stantec, May 2021,* considered the extensive range of existing studies and collated the options that had been identified within these studies. This list provided a solid platform for the option generation process. This list of already generated options was considered against the Transport Planning Objectives and updated to reflect whether the option is now being pursued through another project and either selected or rejected for further consideration within this study. Appendix A sets out the full list of options collated from the previous studies alongside an initial sift of the options, with narrative provided on the rationalisation for selection or rejection of each option for further consideration during the option development process.

4.2.3 Elements of the previous study options selected for progression were incorporated into the option generation process.

4.3 Guiding Design Principals

4.3.1 To help guide the option generation and development process, a set of guiding design principles were developed to describe the key attributes that make a particular mode of transport attractive to use. They are based on national good practice guidance and set out below for each mode.

Table 4.1: Guiding Design Principles

Mode	Guiding Design Principles for Option Development
Walking	The walking design strategy should ensure the frequency, location and type of crossing facilities are appropriate for the surrounding land uses and that all walking routes to/ from and between bus stops and local railway stations are safe and direct. • Routes should be protected from traffic, achieve good levels of forward visibility, and be well lit at all times of the day • Routes should be stepless, surfaces smooth and level, free from obstructions, well maintained and use colour contracting materials to aid guidance • Routes should avoid detours and crossing facilities should be located on desire lines • Routes should use consistent materials to support wayfinding supported by signage where appropriate • Routes should be of good quality, have effective surface water drainage and include trees and seating to provide shelter and resting places
Cycling	The cycling design strategy should be to create a segregated, continuous, off-carriageway route for cyclists along the corridor. • **Safety:** Design should minimise the potential for actual and perceived accident risk. Perceived risk is a key barrier to cycle use and users should feel safe as well as be safe. It is important to provide consistency of design and avoid ambiguity • **Coherence:** Cycling infrastructure should form a coherent network which links origins and destinations. Coherence is about giving people the opportunity to access places by bicycle and to integrate cycling with other modes of travel. Routes should be continuous from an origin to a destination, easy to navigate and of a consistently high quality • **Directness**: Cyclists should be offered as direct a route as possible based on existing and latent trip desire lines, minimising detours, and delays. It should be recognised that directness has both geographical and time elements, and delays at junctions and crossings as well as physical detours will affect use • **Comfort:** Non-sports cyclists prefer sheltered, smooth, uninterrupted, well-maintained surfaces with gentle gradients. Routes should minimise the mental and physical stress required. Routes should meet surface width, quality and gradient standards and be convenient, avoiding complex manoeuvres • **Attractiveness:** The perception of a route is important, particularly in attracting new users. Infrastructure should be designed in harmony with its surroundings in such a way that the whole experience makes cycling an attractive option. A route should complement and where possible, enhance the area through which it passes. The treatment of sensitive issues including lighting, personal security, aesthetics, environmental quality, and noise are important considerations
Bus	The bus strategy should be to create an operating environment for buses that allows services to achieve fast and consistent journey times along all sections of the corridor and provide an attractive and realistic alternative to car travel. • **Reliable:** Bus arrival times at stops are consistent and reliable through the day • **Fast:** Bus journey times equivalent to the car journey time

Mode	Guiding Design Principles for Option Development
	• **Safe:** Access route to the bus stop, waiting environment and onboard environment should be safe and feel safe • **Accessible:** Bus stops must provide buses full access to the kerb to achieve a level boarding and alighting environment as all times • **Integrated:** Bus services should connect spatially and timely with other bus services and rail services • **Attractive:** The waiting environment at bus stops and onboard experience should be comfortable and provide accurate information about the journey
Rail	The rail strategy should ensure all stations along the corridor are well connected (safe and direct) to walking and cycling routes and have efficient interchange facilities for bus and taxi services with secure cycle parking • **Accessible:** Local stations should have safe and attractive walking and cycling routes to the station from the local catchment • **Integrated:** The station forecourt area should allow for easy interchange between bus services, cycling and taxi/ drop off. • **Safe:** The access routes and interchange facilities should be safe and feel safe.

4.4 Level of Ambition

4.4.1 Whilst recognising the overall study ambition to develop **transformational sustainable transport options**, to give flexibility to the option generation and development process, and in recognition that all the design risks have yet to be established, a scalable ambition for the A96 corridor was developed based on the following intervention scenarios:

- **Do-Minimum** interventions consider changes to the highway that resolve existing issues with the provision for walking, cycling and public transport along the corridor. This would include the repair of footway surfacing; providing dropped kerbs and tactile paving at all crossings; kerb works and new Traffic Regulation Orders to make bus stops fully accessible; and junction buildouts to reduce pedestrian crossing distances at side roads. It should also include enhanced street lighting and the identification / signing of more attractive parallel routes.

- **Do-Something** interventions are compatible with the Do-Minimum measure but introduce more significant interventions along the corridor to meet the minimum requirements of the Transport Planning Objectives. This would include measures to give pedestrians new crossing opportunities and greater priority at side road junctions and enhanced bus stop environments with new shelters, comfortable waiting environments and better lighting/ information. New bus priority measures would be introduced and a continuous segregated route for cyclists provided.

- **Do-Gold** interventions have been designed to meet the Transport Planning Objectives but through a more transformative change to the quality of walking, cycling and public transport provision along the corridor. This includes elements of the Do-Minimum and Do-

Something scenarios, but the aim would be to re-engineer the corridor with climate safe interventions that support the national target[7] to reduce car kilometres by 20% by 2030.

4.4.2 It is recognised that as the level of ambition increases so do the risks associated with; construction; technical complexity; availability of funding; overall transport network impact; and public / political acceptability.

4.4.3 Table 4.2 provides an indication of the types of interventions that would be expected to be delivered to meet the level of ambition under each of the three 'scenarios' listed above.

Table 4.2: Interventions under Do Minimum, Do Something and Do Gold scenarios

Mode	Do Minimum	Do Something adds…	Do Gold adds…
Walking	• fix broken paving • introduce tactile paving/ dropped kerbs where missing • tackle footway parking • ensure good and consistent lighting levels • declutter footways • improve wayfinding through signage and consistent use of materials	• footway widening • new crossing facilities where missing • enhanced crossing facilities where there is a poor provision • side road entry treatments to reduce crossing distances • new seating or street furniture to create resting places	• conversion of roundabout to signalised junction to shorten crossing distances at major junctions • replace subways with at-grade crossing • tree planting to create shade and shelter • side road entry treatments to create continuous footways
Cycling	• reallocate road-space for cycle lanes and increase segregation from traffic where possible, widen shared use areas and replace paving with an asphalt surface • remove clutter and tackle footway parking • tighten junction geometries to improve safety • enhance wayfinding through signage and consistent use of materials • remove existing on-street cycle provision if not connected or to standard	• introduction of a fully segregated cycle track along the corridor • safe bypass routes at roundabouts using new Toucan crossings convert existing crossings facilities to Toucan control • introduce dedicated cycle phases or advance greens at signalised junctions and provide good connections to adjacent residential and employment areas	• adapt and enhance the fully segregated cycle track and integrate it with the 'Do-Gold' public transport proposals • include new bus stop bypasses, dedicated cycle phases at any new signalised junctions and local connections to areas of new residential or employment development along or close to the corridor
Bus	• improve the accessibility of bus stops with highway works to modify kerb heights and increase bus stop clearway lengths and operating times • improve the provision to journey information with easily accessed real	• extend and increase the number of bus lanes along the corridor. These would be set back from junction stop lines to maintain junction capacities and operated for a minimum duration of 7am to 7pm. • Deliver a safe and comfortable waiting	• introduce continuous bus lanes or a busway along the corridor to achieve bus rapid transit levels of service • upgrade bus stops to a tram stop level of provision with larger shelters, wider' longer 'platforms', help points,

[7] Scottish Government, 2020. Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update

Mode	Do Minimum	Do Something adds…	Do Gold adds…
	time passenger information and next stops announcements	environment at each bus stop with new shelters, wider 'platforms' and suitable lighting • use of intelligent transport systems to enable a level of priority at signals for buses including green signal 'hurry calls' and 'extensions' within the method of signal control	card readers to 'swipe in' for fare collection

4.4.4 During discussion with the Client Group, it was agreed that the Do Minimum type interventions should not be progressed as these were considered 'business as usual' measures which the Council would be implementing as a matter of course. The Do Minimum interventions on their own, were also not considered to be able to meet the Transport Planning Objectives and in addition, should not be progressed further for that reason. However, such Do Minimum measures should be assumed to be in place in all Do Something and Do Gold options. Further information around the Do Minimum interventions proposed along the corridor are however discussed in Chapter 5 of the *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022,* which should be consulted for further details.

Active Travel Interventions

4.4.5 In line with Transport Scotland's Sustainable Travel Hierarchy, as shown in Figure 4.1, active travel provision along the corridor was considered first, over and above other modes of transport.

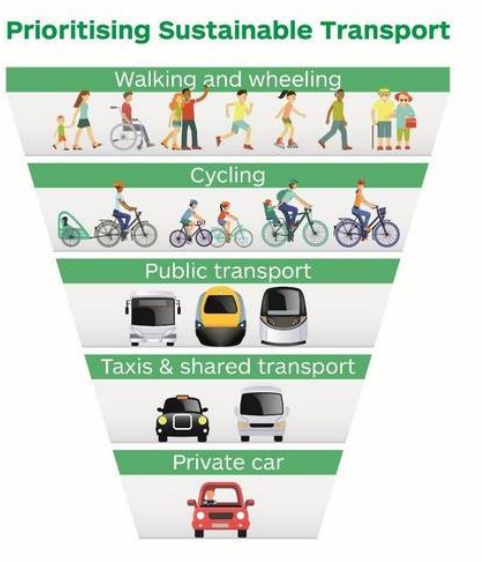


Figure 4.1: Sustainable Investment Hierarchy[8]

[8] National Transport Strategy 2, Transport Scotland

4.4.6 Two forms of cycle provision have been considered:

- A **two-way segregated cycle track** (provided on one side of the carriageway) – examples of which are shown in Figure 4.2
- O**ne-way (with traffic flow) segregated cycle tracks** on each side of the carriageway - an example of which is shown in Figure 4.3

4.4.7 Along with both these cycle track interventions, there would be a range of pedestrian footway improvements including the types of measures described for the 'Do Minimum' in Table 4.2 and further improvements to improve the pedestrian environment such as junction treatments (such as junction geometry tightening on side arms) to slow traffic and improve pedestrian safety.

Figure 4.2: Two-way segregated cycle track – Examples

Figure 4.3: With traffic flow - segregated cycle track - Examples

4.4.8 These two types of intervention have been considered, where appropriate, along the entire Inverurie to Aberdeen (Mounthooly roundabout) corridor. For consistency in provision and to aid user understanding and follow best practice, these two types of provision have been considered as separate options i.e., either the two-way segregated cycle track is provided, or the one-way (with traffic flow) segregated cycle tracks on each side of the carriageway is provided i.e., 'mixing and matching' the two option types along the corridor has not been considered.

4.4.9 Under both proposed active travel options there will be increased segregation for cyclists from traffic. Any walking, cycling and wheeling shared-use areas would be widened with a smooth, asphalt surface. Junction corners would be made tighter to improve safety (by reducing traffic speeds) and lighting would be improved along the network with clear signage being implemented to allow for easy navigation.

4.4.10 The key advantages and disadvantages of the two types of active travel provision are shown in Table 4.3.

Table 4.3 Active Travel Provision – Advantages and Disadvantages

	One way (with traffic flow) Cycle Tracks	Two-way Segregated Cycle Track
Advantages	• Step change improvement to the walking, cycling and wheeling provision • Generally easier to accommodate at large complex signalised junctions • Generally better connectivity to other cycle routes	• Step change improvement to the walking, cycling and wheeling provision • More space efficient (requires less additional land take) • More coherent when the cycle track is detached from the road (e.g., along high-speed roads/ dual carriageways) • Quicker to grit / de-ice and remove snow

	One way (with traffic flow) Cycle Tracks	Two-way Segregated Cycle Track
Disadvantages	• Less space efficient and flexible • Less coherent when the cycle track is detached from the road (e.g., along high-speed roads/ dual carriageways) • Cyclists may incorrectly use the track in the wrong direction if it is easier than crossing a major road	• Connectivity for cyclists to and from the track can be more difficult to manage • Moving between the cycle track and road is more difficult for cyclist travelling against the flow of traffic. • Cyclists may be dazzled by the headlights of on-coming motor vehicles especially in rural locations where there is no street lighting

Bus Intervention Levels

4.4.11 After consideration of active travel provision along the corridor, three bus intervention levels were then developed, one offering a 'Do Something' type standard of intervention and two offering interventions considered to be more transformational and therefore falling into the 'Do Gold' category:

- **Intervention Level 1 (Do Something):** Standard Bus Lanes
- **Intervention Level 2 (Do Gold):** Enhanced Bus Lanes
- **Intervention Level 3 (Do Gold):** Busway (closed bus network)

4.4.12 These three intervention levels are set out in the figure below.

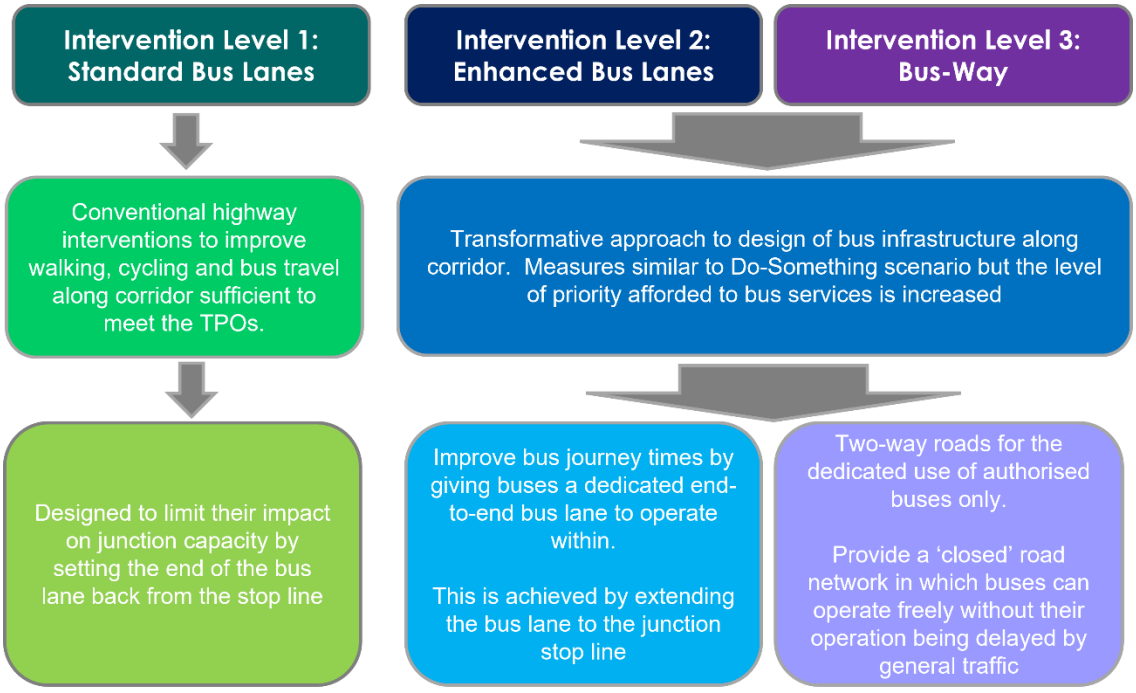


Figure 4.4: Bus Intervention Levels

4.4.13 Example layouts of the three intervention types are shown in the figures below.

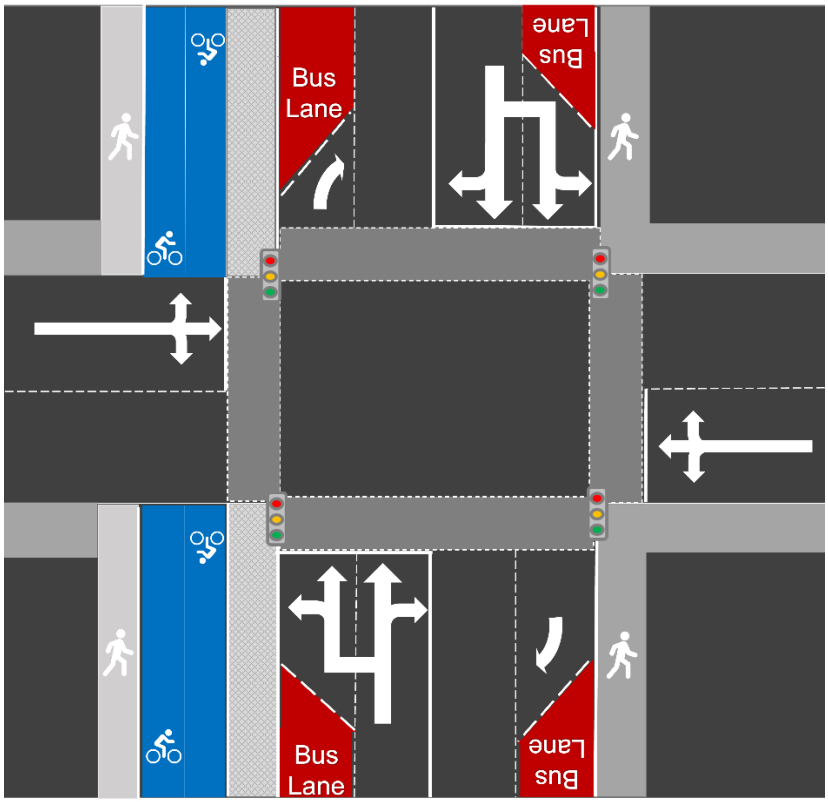


Figure 4.5: Intervention Level 1 – Standard Cycle Lanes - Layout (with 2-way cycle track)

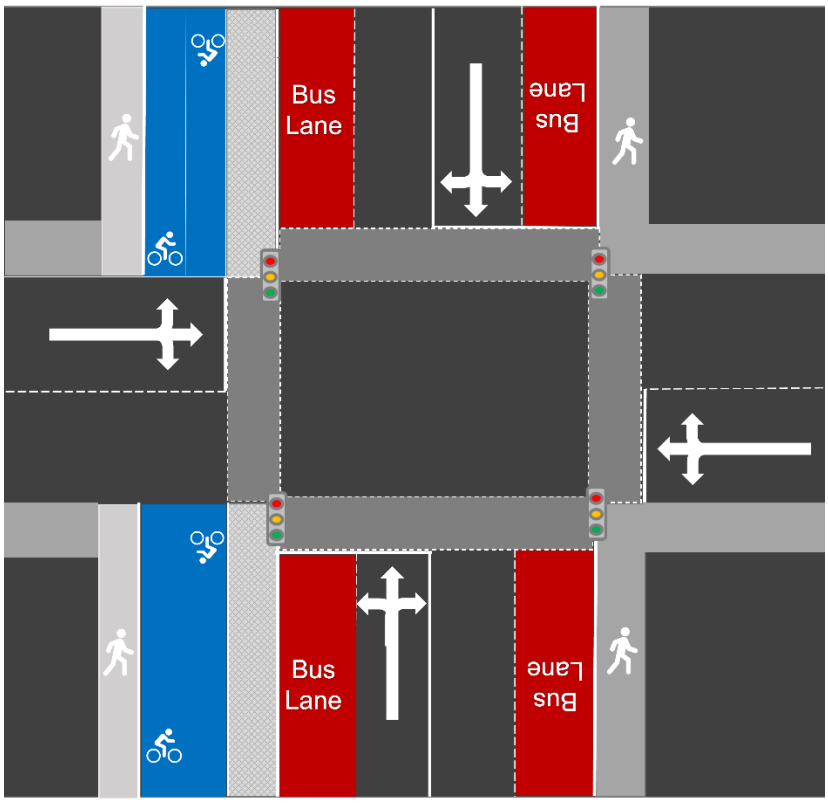


Figure 4.6: Intervention Level 2 – Enhanced Cycle Lanes – Layout (with 2-way cycle track)

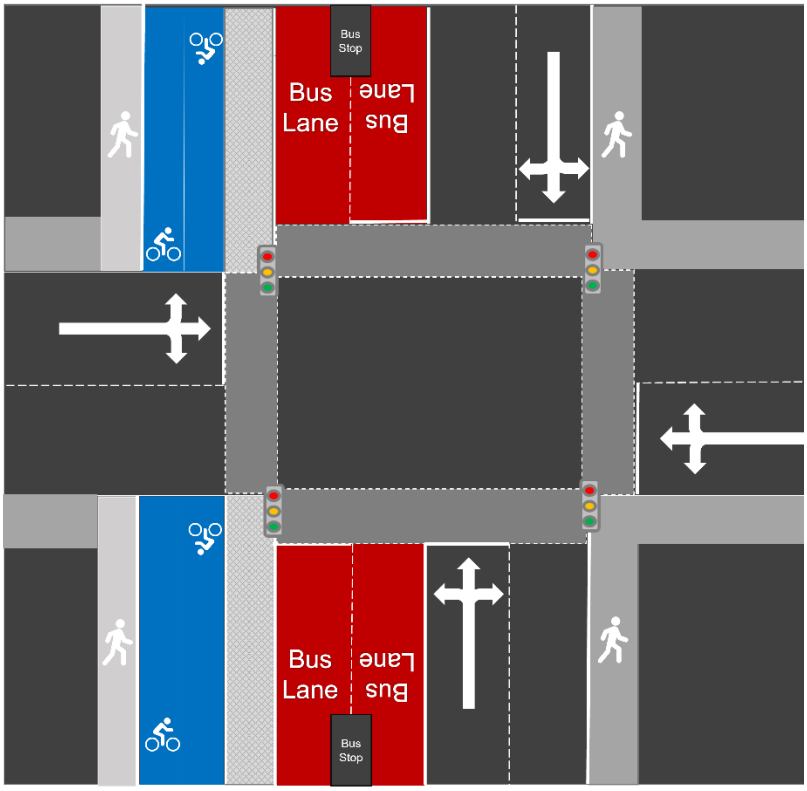


Figure 4.7: Intervention Level 3 - Busway – Layout (with 2-way cycle track)

Bus Intervention Level - Advantages and Disadvantages

4.4.14 The key advantages and disadvantages of the three bus intervention levels are shown in Table 4.4.

Table 4.4: Bus Intervention Levels – Advantages and Disadvantages

	Intervention level 1 Standard Bus Lanes	Intervention Level 2 Enhanced Bus Lanes	Intervention Level 3 Busway
Advantages	• Minimal impact on junction capacity as the bus lane is set back from the junction to maintain stop line capacities. • The junction layout and method of control do not need to change. • Relatively easy to lengthen or widen the bus lanes if required.	• Provides an increased level of protection against general traffic congestion • Relatively easy to modify these types of bus lane as required	• Provides highest level of protection against general traffic congestion. • Potentially less space required than enhanced bus lanes because busway more suitable for autonomous guidance system – require narrower carriageway.
Disadvantages	• Provides some level of priority over general traffic by allowing buses to bypass traffic queues • Reduced link capacity as bus lane removes nearside traffic lane unless the road in widened. This displaces	• With the bus lane extended up to the stop line junction capacity is reduced if additional traffic lanes cannot be provided • Junctions need to be redesigned to accommodate additional traffic lanes and a new	• Junctions need re-engineered to accommodate busway - requires signalisation of small/medium sized roundabouts and part signalisation of large roundabouts.

	Intervention level 1 Standard Bus Lanes	Intervention Level 2 Enhanced Bus Lanes	Intervention Level 3 Busway
	and lengthens the traffic queue which potentially can block-back into the upstream junction causing increased delays along the corridor.	method of signal control to give buses the required level of priority • Road widening likely to be required at junctions and possible along links	• Opportunities to convert busway to tramway - but highway works cost to revert back is substantial. • Can only operate using authorised vehicles • Road widening likely to be required particularly at junctions. • Potentially greater road safety risk to pedestrians due to the non-conventional road layout

4.4.15 Furthermore, to provide an appreciation of the layout with the two active travel options and the three intervention levels the figures below present cross-section diagrams of the road layout for:

- Standard Bus Lanes (Intervention level 1) / Enhanced Bus Lanes (Intervention level 2) with one-way (with traffic flow) cycle tracks
- Standard Bus Lanes (Intervention level 1) / Enhanced Bus Lanes (Intervention level 2) with the two-way cycle track
- Busway (Intervention level 3) with the two-way cycle track. Note that the with one-way traffic flow cycle tracks are not compatible with a busway level of intervention (and hence no cross section for this is provided). While it is not impossible to implement one-way with traffic flow cycle tracks with a busway, this would require additional junction complexity and likely cause confusion to all road users due to the number of different directional 'carriageway' lanes across all modes i.e., creating a cross-section with one-way cycle track, two-way road, one-way cycle track, 2-way busway.

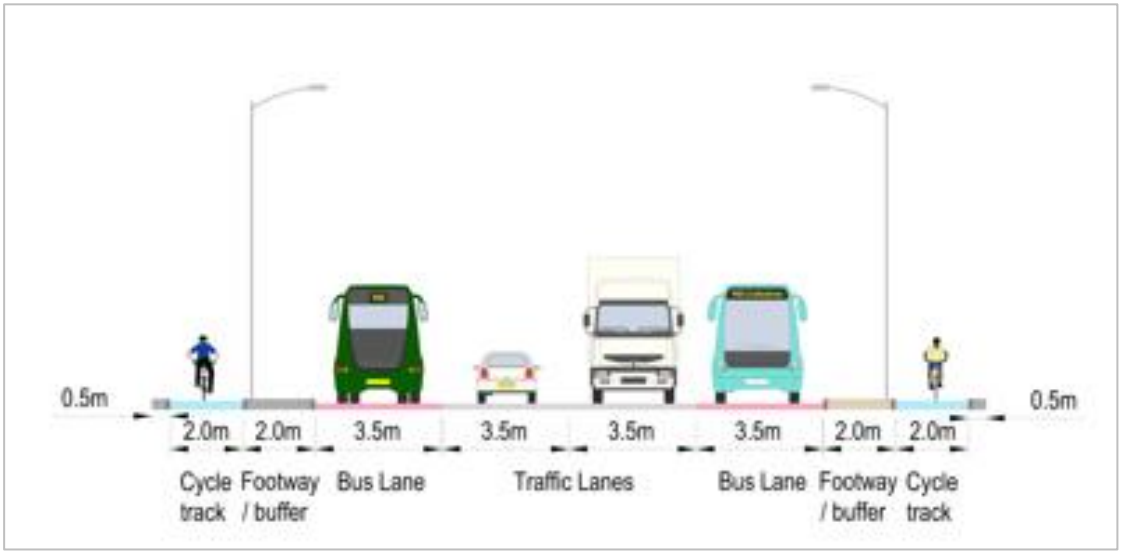


Figure 4.8: Intervention Level 1/2 –Standard / Enhanced Cycle Lanes – Cross-Section (with 1-way with traffic flow cycle tracks)

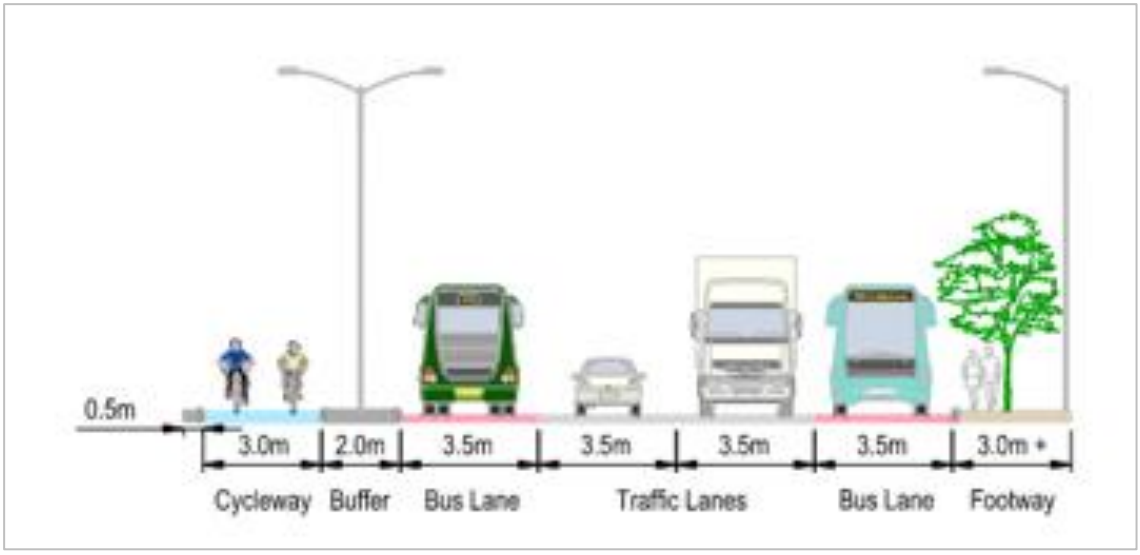


Figure 4.9: Intervention Level 1/2 –Standard / Enhanced Cycle Lanes – Cross-Section (with 2-way cycle track)

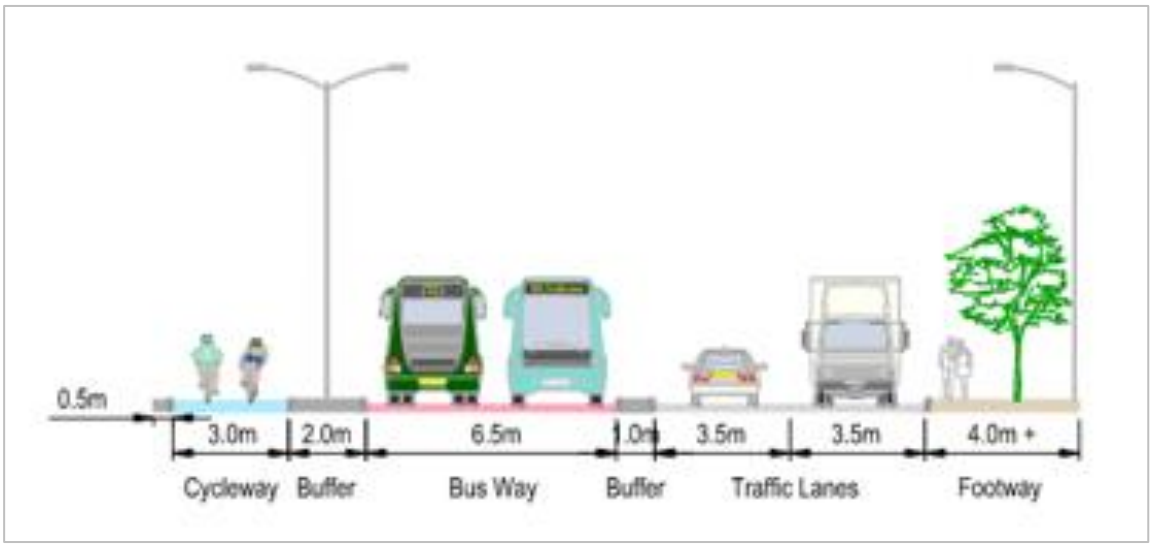


Figure 4.10: Intervention Level 3 – Busway – – Cross-Section (with 2-way cycle track)

4.5 Option Generation and Design Process

4.5.1 Establishing the range of potential 'route' options (combining both active travel and bus infrastructure) was achieved by applying good practice design guidance to bus priority, cycling and walking infrastructure while taking account of the physical constraints along the corridor. Generally, these designs have stayed within or close to the highway boundary but where a more generous provision may be required, such as at bus stops or junctions or to overcome pinch points, land outside the highway boundary may be required.

4.5.2 The option generation process involved a number of key steps (discussed below):

- Segmenting the corridor into segments with similar characteristics (by combining the sections – as presented in Table 2.1 – into longer stretches of carriageway
- Identifying the key existing issues for both active travel and bus travel within each segment

- Understanding how the committed BCIP scheme impacts the corridor and option generation and development process
- Generating end-to-end options across the corridor segments

Corridor segmentation and Key Existing Issues

4.5.3 To assist the design process, the A96 corridor has been divided into four segments to reflect how the road type changes along its length[9].

I. Inverurie to Craibstone
II. Craibstone to Don Street
III. Printfield Walk to Calsayseat Road
IV. Calsayseat Road to Mounthooly

4.5.4 The sections are shown in Figure 4.11.

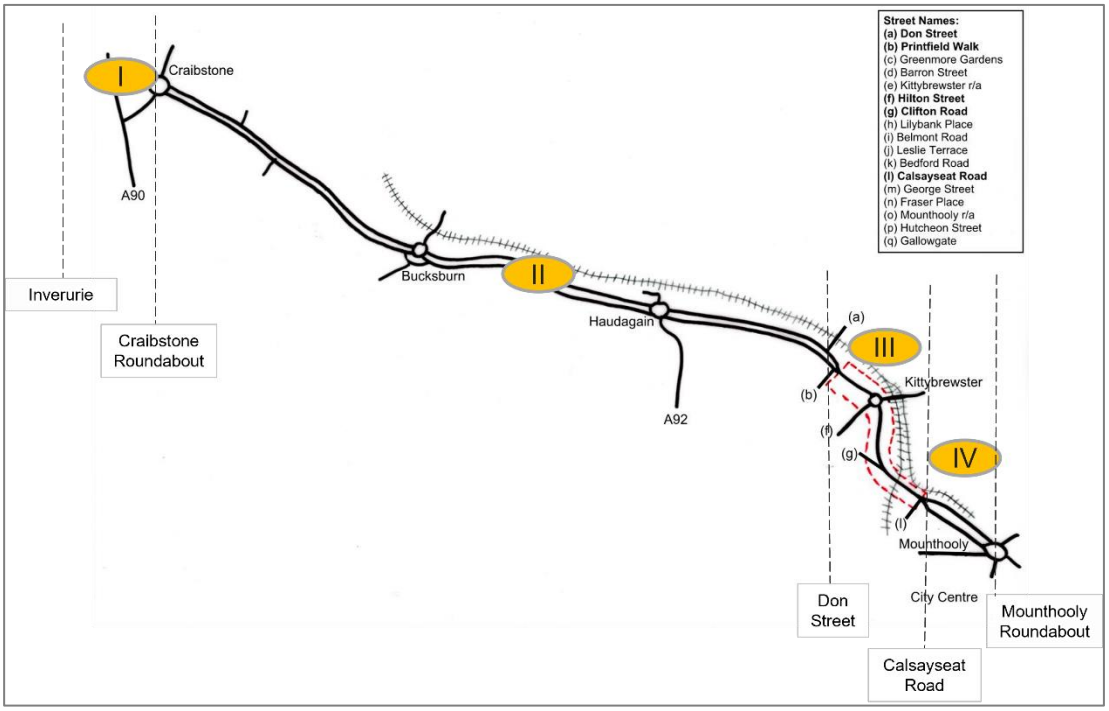


Figure 4.11: Corridor segmentation

4.5.5 From Inverurie to Craibstone (Section I), the A96 is trunk road dual carriageway with significant distances between major junctions, usually large roundabouts. This section of the corridor is maintained and managed by Transport Scotland as part of the Scottish trunk road network.

4.5.6 Aberdeen City Council is the Highway Authority for the section of the A96 east of the Craibstone roundabout and between Craibstone and Printfield Walk (Section II) the road is located within an increasingly urban area, with large employment sites giving way to denser residential areas. In this middle section, the distance between major junctions reduces and minor priority side road junctions join the corridor at increasing frequency.

[9] This a differs from the analysis in the Problems and Opportunities technical note that used 25 sections (11 of which were on the A96 corridor itself) to help focus on the specific issues having a negative impact on the environs for walking, cycling and bus travel along the corridor.

4.5.7 Beyond the Printfield Walk junction (Section III), the road is single carriageway with residential frontages, frequent side road junctions and narrowed sections of road created by the proximity of residential properties and bridge structures.

4.5.8 From the Calsayseat Road junction (Section IV), the road widens out to an urban dual carriageway, and this continues until the road meets the Mounthooly roundabout.

4.5.9 The key issues associated with each section of the existing carriageway is discussed in detail in the *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022*, but is summarised in the table below.

Table 4.5: Bus Corridor Segments Description

Segment		Key Design Issues by Corridor Segment	
		Active Travel	Bus
I	Inverurie to Craibstone (strategic dual carriageway trunk road)	• Development allocations on the west side of the A96 near Inverurie have created significant challenges in terms of accommodating pedestrian and cycle route connections between new development and existing facilities. • There is a need to improve on the cycle provision between Inverurie and Kintore and provide a suitable route between Kintore and the Craibstone roundabout. • A cluster of personal injury collisions involving pedestrians has been identified at the Broomhill roundabout near Kintore (Transport Scotland has programmed an investigation. The investigation will cover the full route of the A96 in relation to fatal accidents and will include a high-level review of pedestrian facilities and pedestrian accidents over the route)	• Traffic queues building up along Elphinstone Road on the approach to the A96 Inverurie roundabout which delays several key bus routes (10, 10B, 10C and 37). • Much of planned development to the south of Inverurie near Thainstone was brought forward prior to the re-opening of Kintore station. There is no obligation therefore in place to improve bus links from these areas to Kintore station
II	Craibstone to Printfield Walk (sub-urban dual carriageway)	• The speed[10], noise and proximity of traffic make the footways on both side of the road unattractive to use. • There is a lack of adequate tactile paving and dropped kerbs to support the most vulnerable road users. • The shared-use path on the northern side of the road is the minimum width (3 metres)	• General traffic journey time variability is high along this section of the corridor[11] and without sufficient bus priority this is likely to increase the unreliability of bus services with increased waiting times at bus stops. • Poor quality bus stop waiting facilities with inadequate shelters and narrow waiting

[10] Presence of speed cameras suggests speeding is an issue

[11] As shown in the *Problems and Opportunities Technical Note*, between the Haudagain roundabout and Kittybrewster roundabout there is a 45 percent variation in travel time between the average quickest and average longest journey time. Between the Sclattie roundabout and the Haudagain roundabout this increases to between 60 and 70 percent.

Segment		Key Design Issues by Corridor Segment	
		Active Travel	Bus
		increasing the risk of pedestrian/ cyclist conflict particularly around bus stops. • Frequent side roads and poor signage and footway markings exacerbate the problem for cyclists. • The footway on the northern side of the road is narrow and obstructed by communal refuse bins. • Central crossing island widths are too narrow making it unsafe to use for those with shopping trolleys or pushchairs, in wheelchairs or as cyclists. • Extensive issue of guardrails indicates this is a hostile environment for vulnerable road users. • There is a cluster of accidents immediately south of Haudagain roundabout on the A92 indicating higher road safety risk at this location. • On approach to Bucksburn Roundabout reduced signage makes it unclear where cyclists should go. The pavement here is also edged with guardrail which narrows the width and creates conflict with pedestrians. • During events at TECA, relatively high volumes of pedestrians were observed walking in highly unsafe areas on the A96 between TECA and the Craibstone Park & Ride. • The Sclattie roundabout has poor facilities for those walking or cycling.	area in close proximity to high speed/ high flow traffic conditions. • Scotland's Rural College has lost two roadside bus stops on the A96 heading north out of Aberdeen due to the APWR works, potentially detracting from use of sustainable modes to access the college • Buses services were regularly noted to be behind schedule during the site visit audit
III	Printfield Walk to Calsayseat Road (urban single carriageway)	• The speed, noise and proximity of traffic make the footways on both side of the road unattractive to use. • Sections of shared-use path are too narrow which increases the risk of conflict between pedestrians and cycle movements particularly around bus stops. Frequent side roads, poor signage and footway markings exacerbate the problem for cyclists.	• General traffic journey time variability continues to be high and without sufficient bus priority measures, this is likely to increase the unreliability of bus services and waiting times at bus stops. • Poor quality bus stop waiting facilities with inadequate or missing shelters and narrow waiting areas in close proximity to high traffic flows.

Segment		Key Design Issues by Corridor Segment	
		Active Travel	Bus
		• There are significant areas of damaged footway paving (due to footway parking) creating trip hazards and sections continues to be obstructed by communal bins. • General lack of safe crossing facilities. • In certain sections the only source of lighting is from the streetlights on the central reservation which reduces active travel user security. • A poorly signposted section of shared use path just after the Kittybrewster Primary school on approach to Kittybrewster roundabout potentially leads cyclists to take a less safe/ inappropriate route. • The Don Street junction has a large footprint with narrow pedestrian islands creating a safety risk for those waiting on the island, particularly those with shopping trolleys or pushchair, in wheelchairs or on a bike. • The Belmont Road junction has narrow footways and poor-quality tactile paving provision. The left turn slip and high number of motor vehicle conflicting movements make the junction a high risk for cyclists. • Heavy Goods Vehicles account for between 10- 12 percent of peak hour traffic (as noted in the *Problems and Opportunities Technical Note)* increasing the risks to cyclist within this section of the corridor	• Not all bus stops have clearway or bus cage road markings resulting in inaccessible boarding and alighting points. • Cars were observed parking in bus stops during the audit
IV	Calsayseat Road to Mounthooly (urban dual carriageway)	• Pedestrian island crossing at Fraser Place too narrow for those with prams or wheelchairs leading to increased pedestrian safety risks. • Unclear where the shared use path stops, and cyclists need to join the dual carriageway leading to user confusion and potentially cyclists using a less safe/ inappropriate route • Communal bins are kept on the pavement and bus shelters make the shared use path	• General traffic journey time variability continues to be high and without sufficient bus priority measures, will lead to increased bus service unreliability and waiting times at bus stops. • Bus stops continue to have poor waiting environment with missing or poor-quality shelter provision. • Bus stops are not accessible due to incorrect kerb heights

Segment		Key Design Issues by Corridor Segment	
		Active Travel	Bus
		narrow and present a safety risk to cyclists and potential conflicts with others using the footway.	and missing clearway and cage markings

Berryden Corridor Proposals

4.5.10 The option development process has built on the committed Berryden Corridor Improvement Project (BCIP). The BCIP will provide two general traffic lanes in both directions throughout the length of the corridor, widening the existing road between Skene Square and Ashgrove Road and creating a new road between Ashgrove Road and Kittybrewster Roundabout. Alongside the improved carriageway there will be new shared and segregated infrastructure for pedestrians and cyclists. The BCIP does not provide any prioritised infrastructure for buses.

4.5.11 A schematic plan of the BCIP is shown below in Figure 4.12.

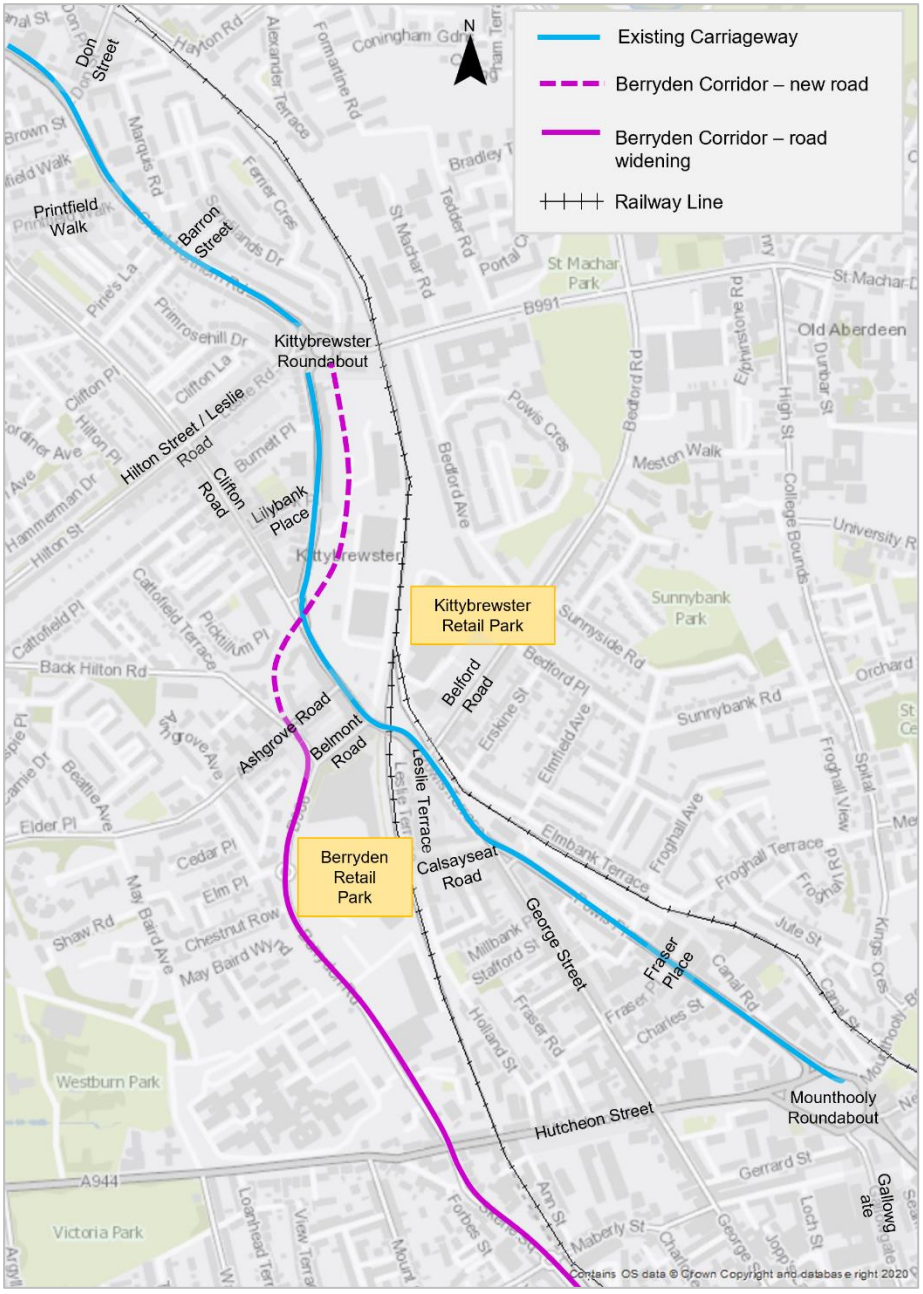


Figure 4.12: Schematic diagram of the BCIP and overlap with the A96 corridor

4.5.12 The scheme has undergone significant appraisal with justification to construct the scheme based on a number of key benefits including:

- Improved journey times and connections
- Reduced congestion
- Enabling the rerouting of traffic from the city centre core due to the City Centre Masterplan
- Improved bus journey time reliability
- Improved pedestrian and cycle provision

4.5.13 Planning consent was granted in 2020 and the Compulsory Purchase Order for the land required for the project was confirmed by Scottish Ministers in June 2021.

4.5.14 The single carriageway section between Kittybrewster Roundabout and Printfield Walk (at the northern end of the scheme) is not yet committed as part of the project.

4.5.15 The BCIP has significant implications on the design of bus priority and active travel measures within the section of the A96 where there is overlap i.e., from the Clifton Road junction to the Kittybrewster roundabout.

4.5.16 An outcome of the BCIP is therefore the creation of a dual carriageway for general traffic between the city centre and Kittybrewster roundabout. However, this A96 study seeks to create a more efficient bus operating environment and consistent cycle provision, and to achieve this requires a reallocation of road space from general traffic. Any reallocation of road space along the A96 (either from existing dual carriageway or new sections created by the BCIP) will create a point where the A96 corridor reduces back to single carriageway. This will impact on the benefits forecast for the BCIP which are based on the corridor being a dual carriageway along its length.

4.5.17 For the purposes of option generation, and reflecting the policy environment, it was deemed appropriate to assume that the BCIP (and the additional road capacity it creates) should be considered as an opportunity for the study. As such, options which utilise the BCIP (i.e., reallocate road space in the Berryden corridor), in part or wholly, have been considered.

4.5.18 Given the planning consents for the BCIP are already approved, these sections of the scheme are considered committed (although potentially subject to change under the various options) for the purposes of option generation. However, it is noted that an option has been developed which assumes the BCIP is not implemented.

Option Generation

4.5.19 As noted above, option generation was considered on an end-to-end corridor basis. Full details of the development process and rationale for the interventions proposed across the four segments as described above can be found in *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022.*

4.5.20 Five different end-to-end 'route' variants were proposed (A, B, C, D and E) under each of the three bus priority intervention levels, so a total of 15 options (note that all route variants include active travel provision as discussed in Section 4.4). With intervention level 1 representing the *Standard Bus Lanes* concept, intervention level 2 the *Enhanced Bus Lanes* concept, and intervention level 3 the *Busway* concept, the only difference between, for instance, Option 2B and 3B was the level of proposed intervention (i.e., enhanced bus lanes or busway, in this instance, with the route variant similar).

4.5.21 In addition, over segments I, II and IV (as presented in Figure 4.11), the variants A, B, C, D and E within each level of intervention (*Standard Bus Lanes, Enhanced Bus Lanes* or *Busway*) are the same, with the difference between the A, B, C, D and E variants occurring over Section III – where the corridor is constrained and the committed BCIP is assumed to be in place , although note that variant A considers the potential road layout if the BCIP were not to go ahead.

4.5.22 Active travel proposals for the corridor, as noted above, are either assumed to be the two-way cycle track or the with traffic flow one way cycle tracks. Also, as noted above, both active travel options can be implemented alongside the standard and enhanced bus lane intervention levels (1 and 2) but are not compatible with the busway level of intervention (level 3).

4.5.23 It is noted that under intervention level 3 (busway), as the bi-directional busway would be located on one side of the main carriageway (likely the northern side), pedestrians (bus users

accessing stops) will need to cross from the southern side of carriageway to access the busway bus stops. However, the busway stops themselves would offer a more accessible boarding and alighting environment with high quality bus stops.

4.5.24 As a high-level summary, the options developed are shown in Table 4.6. Further, more detailed information can be found in Appendix B and in the *A96 Multi-modal Transport Study - Option Development Report,* which presents concepts designs for the options.

Table 4.6: High Level Option Description

Segment	Variant	Description
I: Inverurie to Craibstone	A, B, C, D & E	**Active Travel:** There is an existing shared-use path between Inverurie and Kintore which would be upgraded to ensure consistency with the corridor active travel proposals. Aberdeenshire Council are progressing an active travel route option between Kintore and Blackburn. All route options consider the implementation of a new active travel route between Blackburn and Craibstone, adjacent to the A96 (this proposed shared-use path would link the existing and planned provision between Inverurie and Blackburn). This would provide a continuous active travel route between Inverurie and Craibstone Roundabout **Bus:** There are minimal delays to bus services between Inverurie and Craibstone except for some delay experienced exiting Inverurie onto the A96 trunk road. As such, no interventions are planned along the A96, except for a stand-alone junction improvement (slip lane) at Port Elphinstone to enable traffic to more easily exit the local Elphinstone Road onto the A96 eastbound. There is potential third-party land required along the full length of this section to accommodate the shared-use active travel route
II: Craibstone to Printfield Walk	A, B, C, D & E	**Active Travel:** A two-way segregated cycle track (located on the northern side of the carriageway) or one-way (with traffic flow) segregated cycle tracks **Bus:** Standard bus lanes, enhanced bus lanes or the busway are proposed for the full length of this section with the capacity for general traffic reduced to a single lane Potential third-party land required along the full length of the section.
III: Printfield Walk to Calsayseat Road and IV: Calsayseat Road to Mounthooly	A Assumes BCIP not in place	While the Council has confirmed the BCIP will be implemented, Option A was developed as a 'baseline' and in order to compare and develop options further as part of this study. Option A therefore assumes that the development of measures must use the existing road network to deliver improvements to the walking, cycling and bus environments between the Don Street and George Street junctions. **Active Travel:** A two-way segregated cycle track (located on the northern side of the carriageway) or one-way (with traffic flow) segregated cycle tracks. At the Kittybrewster roundabout the two-way track will need the crossing on Machar Drive to be upgraded to Toucan control, to bypass the roundabout and continue along the eastern side of the road towards Powis Terrace. Retaining the cycle track adjacent to the eastbound carriageway reduces the number of side road interactions. **Bus:** • For intervention level 1 (standard bus lanes) or 2 (enhanced bus lanes) introduces east and westbound bus lanes along the Great Northern Road between Printfield Walk and the Kittybrewster

Segment	Variant	Description
III: Printfield Walk to Calsayseat Road and IV: Calsayseat Road to Mounthooly		roundabout. These bus lanes are staggered because of the road width available (11 metres approx.). It is also potentially possible to provide an eastbound bus lane on the approach to the Belmont Road junction. • Because of the restricted road widths through this section of the corridor, the intervention level 3 (busway) could not be provided with variant A.
	B Uses BCIP between Kittybrewster Roundabout and Powis Terrace	**Active Travel:** Segregated two-way cycle track (on the northern side of Great Northern Road until Kittybrewster Roundabout, where it crosses the road to continue on the eastern side of Great Northern Road, before reaching the new junction at Great Northern Road / Clifton Road) or one-way (with traffic flow) segregated cycle tracks on both sides of the carriageway. The route then continues down Powis Terrace and Powis Place to Mounthooly Roundabout (as either the segregated two-way cycle track or one-way with traffic flow segregated tracks). Note that cycle track provision would be continuous, even in places where there are 'gaps' in bus priority as noted below (at Belmont Road railway bridge). **Bus:** Uses additional highway capacity created by Berryden Corridor scheme (Kittybrewster Roundabout to Powis Terrace) to deliver either standard bus lanes, enhanced bus lanes or the busway: • Assumes road widening between Kittybrewster Roundabout and Printfield Walk - loss of parking and potential third-party land required, but if this were not possible, traffic 'gating' would be implemented to provide bus priority (this would reduce traffic queuing in this narrower section of the corridor, allowing buses and general traffic to keep moving) • No widening at Belmont Road railway bridge and priority given to the active travel route through this section, with traffic gating (traffic queue relocation) - therefore a 'gap' in the continuous provision of the bus lanes/busway • Kittybrewster Roundabout would be signalised if a busway (intervention level 3) were implemented • New junction configuration required at Clifton Road, Great Northern Road junction and Powis Terrace
	C Uses BCIP between Kittybrewster Roundabout and Powis Terrace, with road widening at Belmont Road Railway Bridge	**Active Travel:** Segregated two-way cycle track (on the northern side of Great Northern Road until Kittybrewster Roundabout, where it crosses the road to continue on the eastern side of Great Northern Road, before reaching the new junction at Great Northern Road / Clifton Road) or one-way (with traffic flow) segregated cycle tracks on both sides of the carriageway. The route then continues down Powis Terrace and Powis Place to Mounthooly Roundabout (as either the segregated two-way cycle track or one-way with traffic flow segregated tracks) **Bus:** Builds on Option B (above) and proposes the widening of the road along Powis Terrace, between the Clifton Road and Calsayseat Road junctions to deliver continuous standard bus lanes, enhanced bus lanes or the busway: • Would require the road widening between Clifton Road and Calsayseat Road including the widening of Belmont Road railway bridge • Assumes road widening between Kittybrewster Roundabout and Printfield Walk - loss of parking and potential third-party land required, but if this were not possible, traffic 'gating' would be implemented to provide bus priority. This would reduce traffic queuing in this narrower section of the corridor, allowing buses and general traffic to keep moving

Segment	Variant	Description
III: Printfield Walk to Calsayseat Road and IV: Calsayseat Road to Mounthooly	D Uses BCIP between Kittybrewster and Skene Square	**Active Travel:** Segregated two-way cycle track (on the northern side of Great Northern Road until Kittybrewster Roundabout, where it crosses the road to continue on the eastern side of Great Northern Road, before reaching the new junction at Great Northern Road / Clifton Road) or one-way (with traffic flow) segregated cycle tracks on both sides of the carriageway. The route then continues down Powis Terrace and Powis Place to Mounthooly Roundabout (as either the segregated two-way cycle track or one-way with traffic flow segregated tracks). Additional active travel provision is proposed along the BCIP south of Clifton Road and onwards to Union Square. It is recognised that active travel provision has been included in the BCIP design, but this may need upgrading / altering to provide a consistent level of provision across the full A96 corridor with appropriate tie-in at Clifton Road **Bus:** Proposes that the full length of the improved Berryden Corridor is used to deliver a continuous standard bus lane, enhanced bus lane or a busway from Craibstone to the rail/bus station (as an alternative to the A96 route along Powis Terrace and Powis Place): • Some bus services would be reassigned to operate along the Berryden Corridor to the city centre railway and bus stations • Assumes road widening between Kittybrewster Roundabout and Printfield Walk - loss of parking and potential third-party land required, but if this were not possible, traffic 'gating' would be implemented to provide bus priority. This would reduce traffic queuing in this narrower section of the corridor, allowing buses and general traffic to keep moving
	E Uses Great Northern Road (rather than Berryden Corridor) between Kittybrewster Roundabout and Powis Terrace / Powis Place to Mounthooly	**Active Travel:** Segregated two-way cycle track (on the northern side of Great Northern Road until Kittybrewster Roundabout, where it crosses the road to continue on the eastern side of Great Northern Road, before reaching the new junction at Great Northern Road / Clifton Road) or one-way (with traffic flow) segregated cycle tracks on both sides of the road. The route then continues down Powis Terrace and Powis Place to Mounthooly Roundabout (as either the segregated two-way cycle track or the one-way with traffic flow segregated tracks) **Bus:** Uses Great Northern Road (rather than Berryden Corridor) between Kittybrewster Roundabout and Powis Terrace / Powis Place to Mounthooly • Assumes road widening between Kittybrewster Roundabout and Printfield Walk - loss of parking and potential third-party land required, but if this were not possible, traffic 'gating' would be implemented to provide bus priority. This would reduce traffic queuing in this narrower section of the corridor, allowing buses and general traffic to keep moving • For all levels of bus intervention, the section of Great Northern Road between Kittybrewster Roundabout and Powis Terrace would be restricted to local access and bus / cycle only using bus gates at each end • Would require the road widening between Clifton Road and Calsayseat Road including the widening of Belmont Road railway bridge • Provides continuous standard bus lane, enhanced bus lane or busway from Craibstone Roundabout to Mounthooly Roundabout • Junction layout at intersection of Berryden Corridor with Clifton Road requires additional land and possible closure of Clifton Road arm to general traffic

4.5.25 The term 'traffic gating' is noted in the table above as a measure to provide a level of bus priority where there is insufficient space for carriageway reallocation to bus lanes. Traffic

gating is a technique used to control the inflow of vehicles into sensitive areas where it is particularly important to prevent serious congestion. One of its most important applications is to reduce bus delays by relocating congestion from narrow sections of the road network into an upstream section where bus lanes can be provided. Buses are then able to bypass the queued relocated traffic via the bus lane and enter the downstream section which is maintained as free flowing by the traffic gating signals. Journey times for general traffic remain approximately the same as they effectively queue on a different section of road and then benefit from the free-flowing conditions once past the gating point.

4.5.26 In summary, the five bus priority routes can be defined by:

- The end point, either Mounthooly or Union Square and by implication its route from the A96 / Clifton Road junction either along the new BCIP or via the A96 Powis Terrace / Powis Place
- Its route between Kittybrewster roundabout and the A96 / Clifton Road junction, either via the BCIP or Great Northern Road
- Whether the Belmont Road railway bridge is widened or not

These combinations are set out in the table below, with the figure that follows setting out a high level diagram showing how they differ – over segments III and IV (noting that the routes are the same over segments I and II)

Table 4.7: Summary of bus route variants

Route Variants	**End point**	**BCIP South (Kittybrewster-Union Square)**	**BCIP North (Kittybrewster-Clifton Road)**	Gt Northern Road (**Kittybrewster-Clifton Road**)	Belmont Road Bridge **widening (Kittybrewster to Mounthooly)**
A	Mounthooly	NA	NA	✓	×
B	Mounthooly	×	✓	×	×
C	Mounthooly	×	✓	×	✓
D	Union Square	✓	✓	×	×
E	Mounthooly	×	×	✓	✓

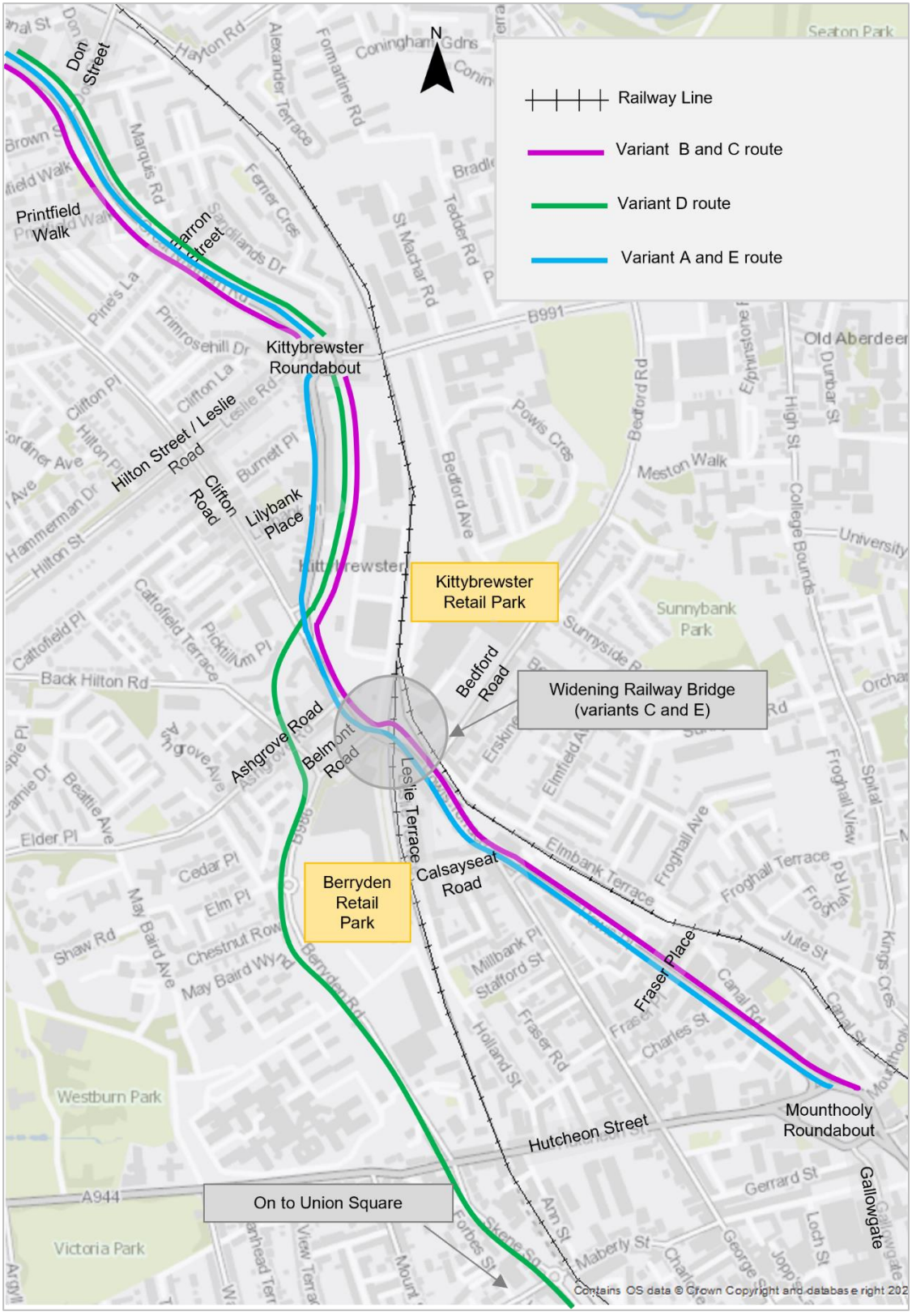


Figure 4.13: All Route Variants

4.5.27 The active travel proposals under each of the route variants is presented in the figure below. As noted above, this would provide cycling provision provided by either:

- the segregated two-way cycle track (on the northern side of Great Northern Road until Kittybrewster Roundabout, where it crosses the road to continue on the eastern side of Great Northern Road, before reaching the new junction at Great Northern Road / Clifton Road), or

- one-way (with traffic flow) segregated cycle tracks on both sides of the carriageway.

4.5.28 The active travel proposals then continue down Powis Terrace and Powis Place to Mounthooly Roundabout (as either the segregated two-way cycle track or one-way with traffic flow segregated tracks).

4.5.29 Under variant D, additional active travel provision is proposed along the BCIP south of Clifton Road and onwards to Union Square. It is recognised that active travel provision has been included in the BCIP design, but this may need upgrading / altering to provide a consistent level of provision across the full A96 corridor.

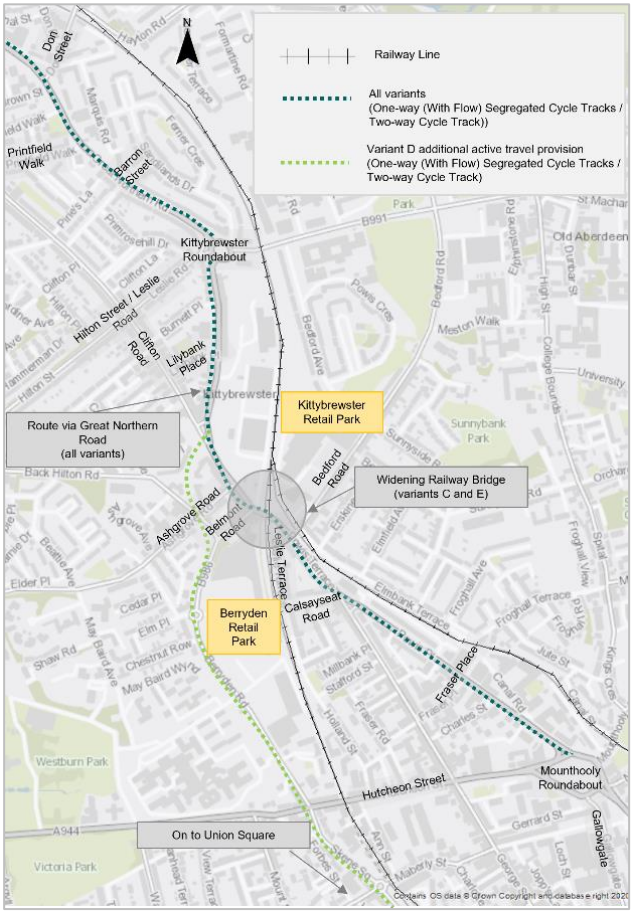


Figure 4.14: All Route Variants – Active Travel

4.5.30 Concept sketches are provided for the individual route variants below covering the entire corridor from Inverurie to Mounthooly. For the bus proposals, as all options are similar between Inverurie and Craibstone, and Craibstone and Printfield Walk (with the only difference the level of intervention assumed), the first two figures presented below show these sections. Thereafter, the figures relate to the individual route variants (A, B, C, D and E) between Printfield Walk and Mounthooly roundabout / city centre.

4.5.31 More detailed option drawings (concept designs) can be found in the *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022*.

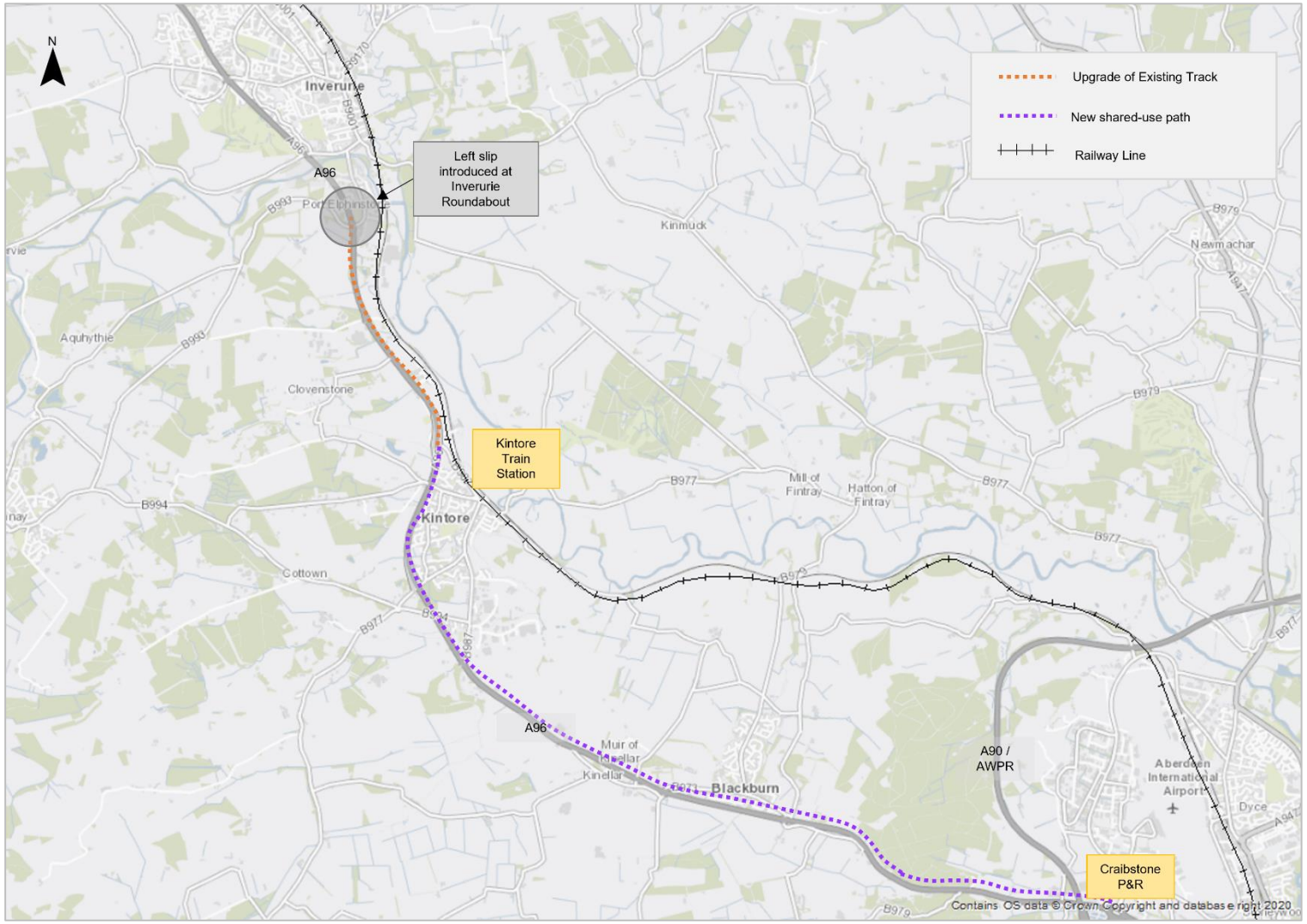


Figure 4.15: Variants A, B, C, D and E: Inverurie to Craibstone

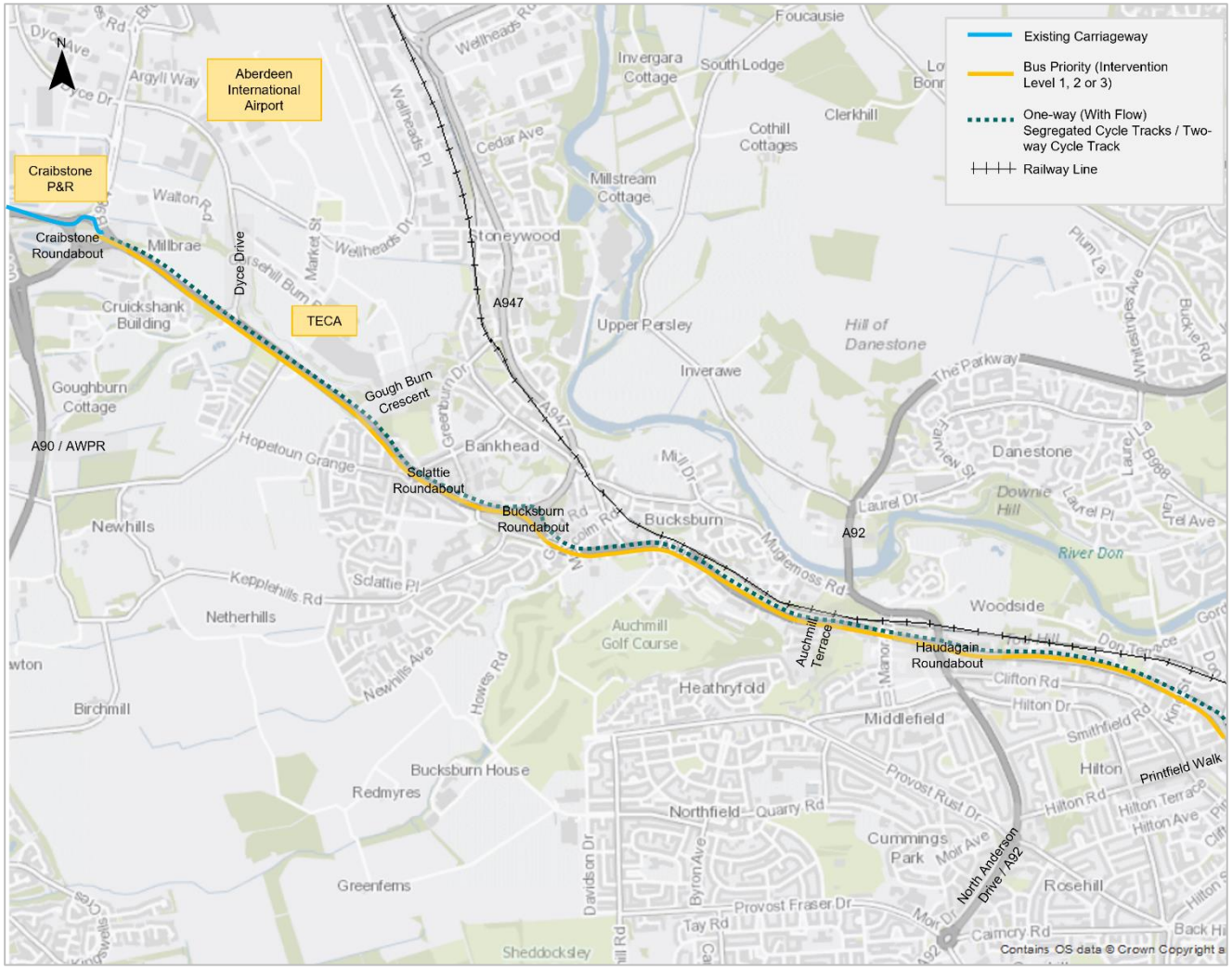


Figure 4.16: Variants A, B, C, D and E: Craibstone to Printfield Walk

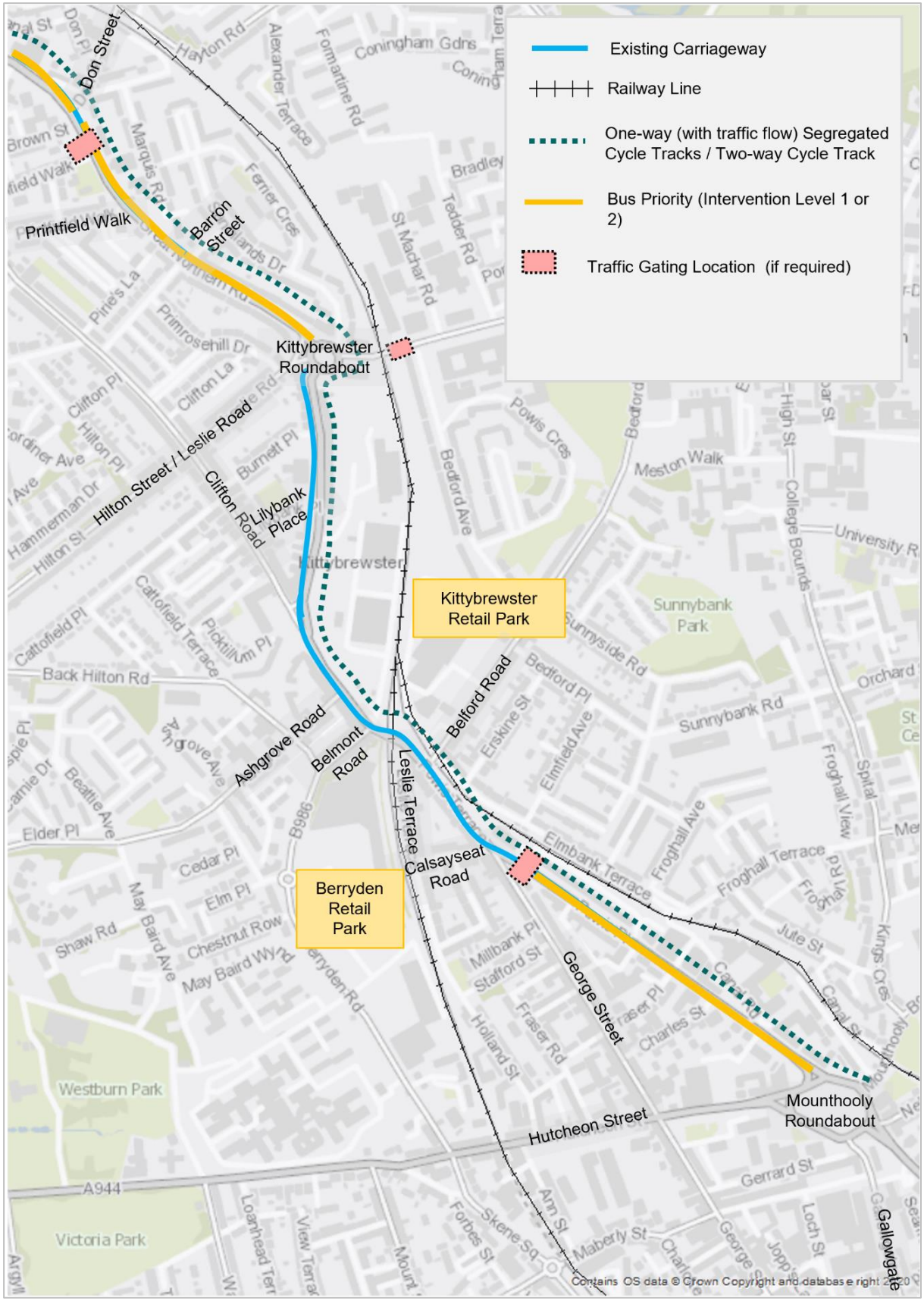


Figure 4.17: Variant A: Printfield Walk to Mounthooly

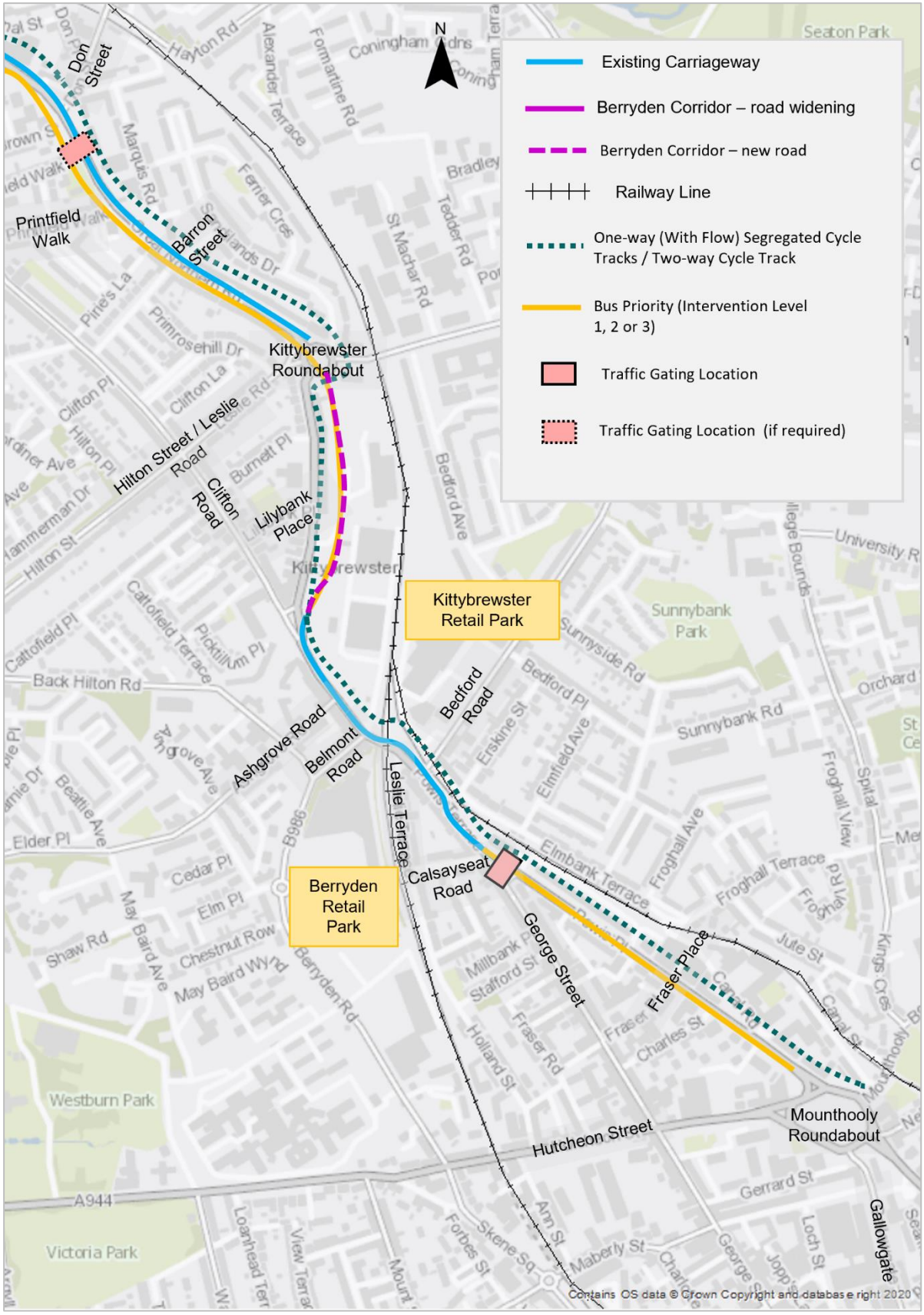


Figure 4.18: Variant B: Printfield Walk to Mounthooly

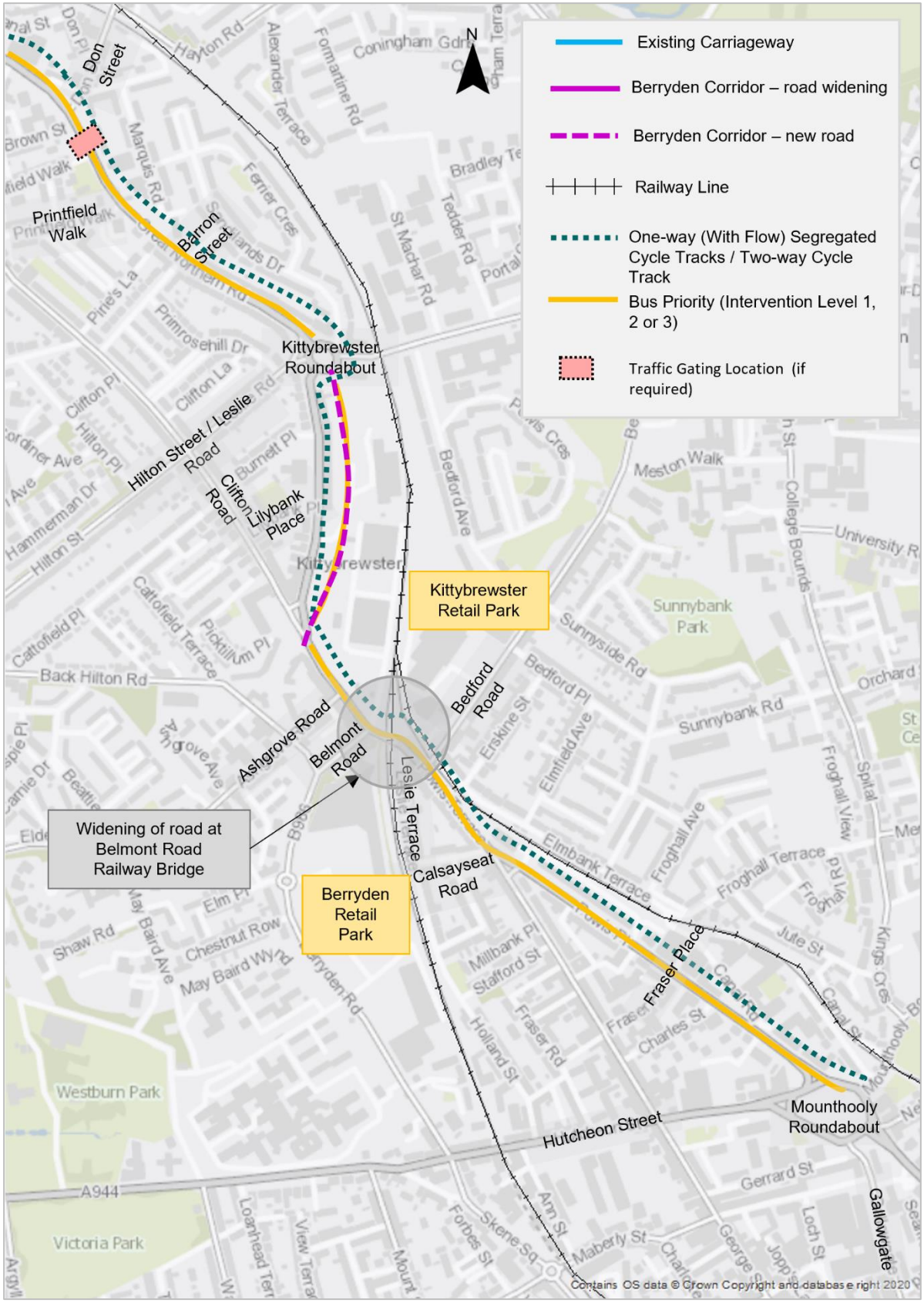


Figure 4.19: Variant C: Printfield Walk to Mounthooly

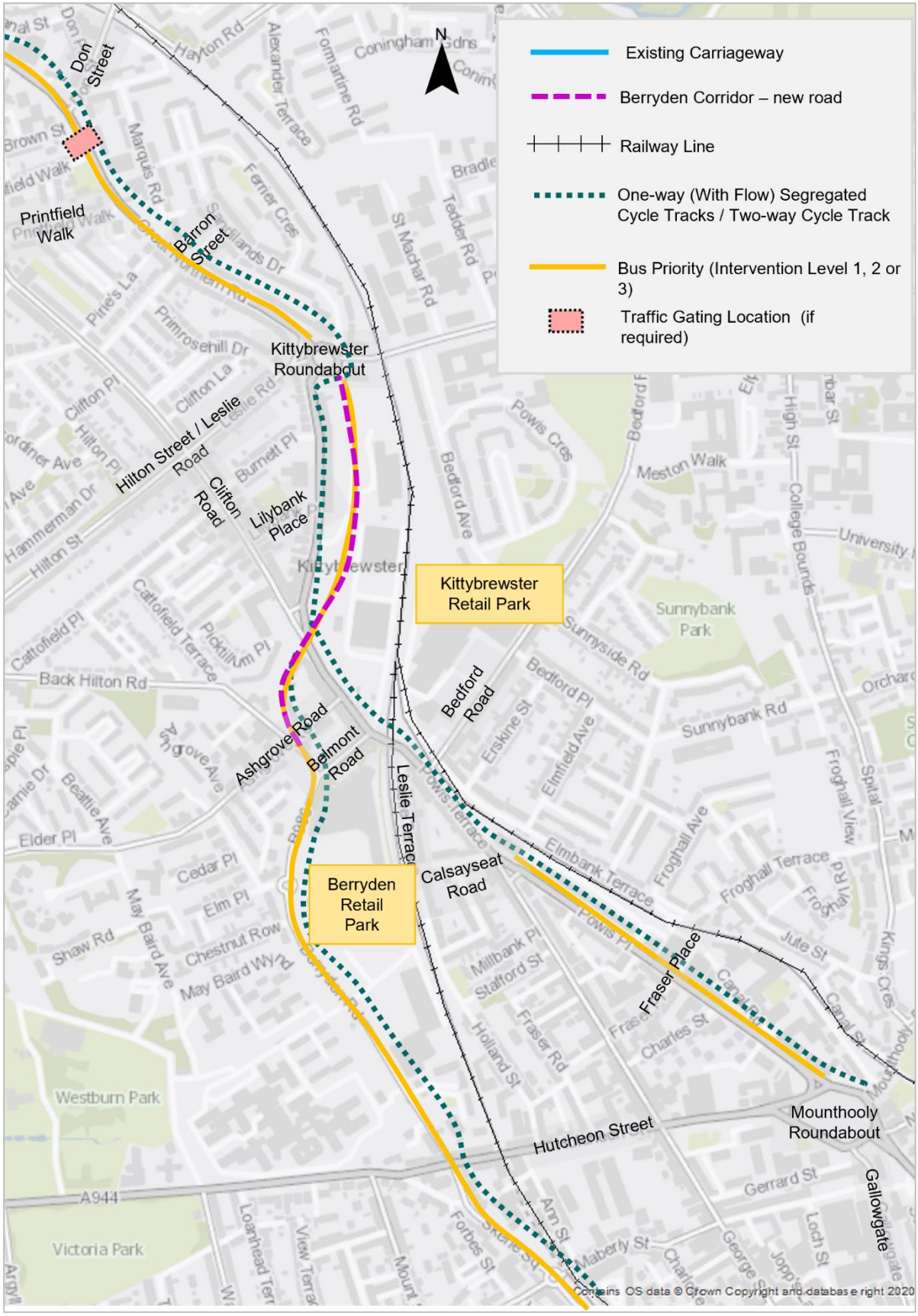


Figure 4.20: Variant D: Printfield Walk to Mounthooly

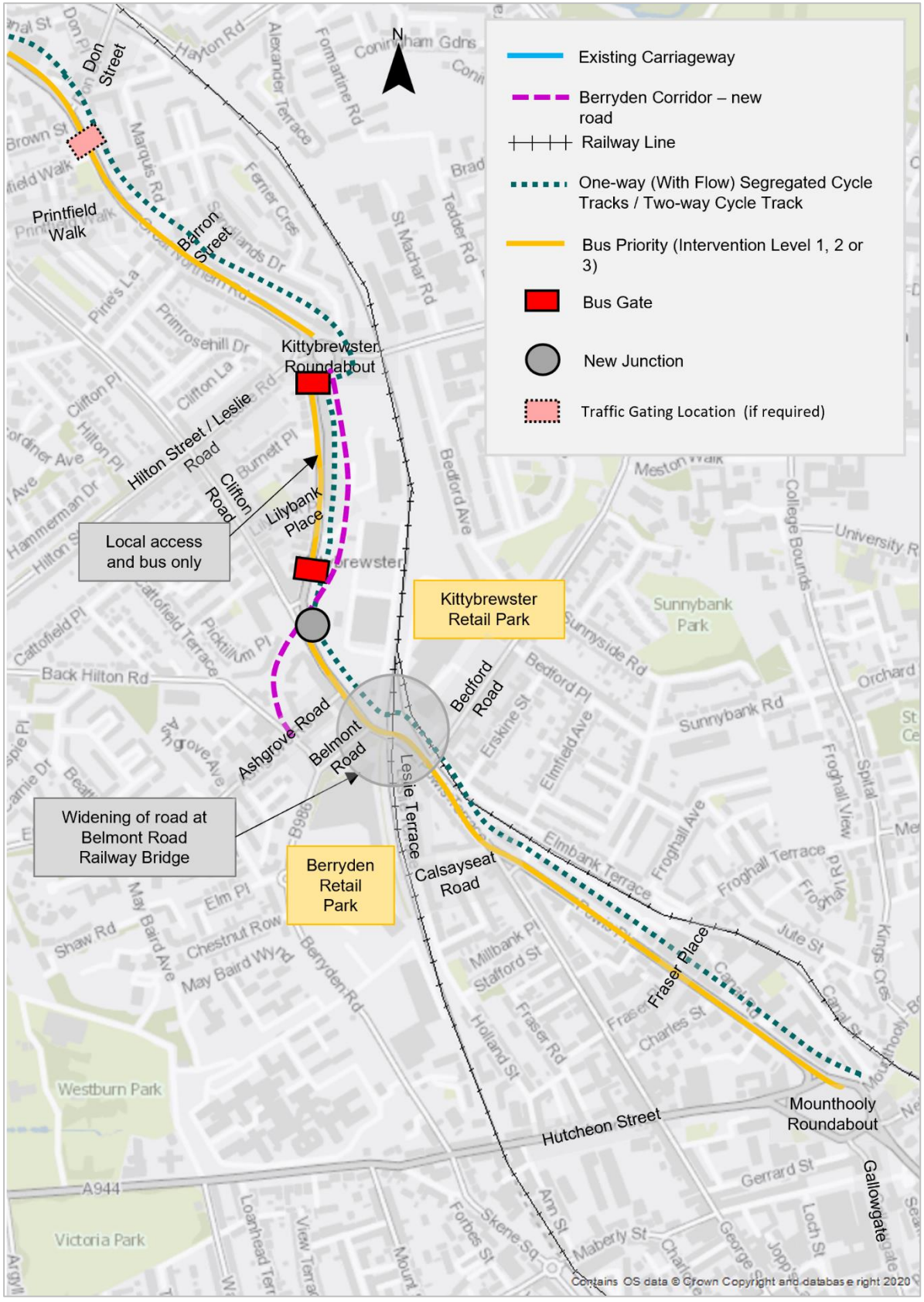


Figure 4.21: Option Variant E: Printfield Walk to Mounthooly

4.6 Options: Key Issues and Risks for Consideration

4.6.1 Table 4.8 sets out the key issues and risks relating to each option for consideration during the preliminary options appraisal.

Table 4.8: Key Issues

Option	Key Issue / Risk Description
Issues	
All options	**Loss of on-street parking:** reallocation of road space along the Great Northern Road between Don Street and Clifton Road
	Highway widening: need for localised widening of the highway along the Great Northern Road between Printfield Walk and Clifton Road and along Powis Terrace
	Berryden Corridor scheme objectives: inconsistency between the TPO's of the Berryden Corridor scheme and this study will need to be resolved
	Dualling between Kittybrewster and Printfield Walk: Feasibility of this phase requires a widening of the road into front gardens which depending on land ownership would require CPO powers
	Clifton Road junction design: layout and operation of the Clifton Road junction will be complicated by the competing priorities from general traffic, bus, cycle, and pedestrian demands
C & E variants	**Powis Terrace:** proposed widening of Powis Terrace will require the replacement of the Belmont Road railway bridge and the potential construction of a retaining wall alongside the railway south of the bridge
D variants	**Bus service routing:** two key issues: • Takes buses away from existing well-used bus stops – with the impacts on passenger demand • Requires a fundamental review of bus routes in the city centre with implications on the city centre masterplan.
Design and Operational Risks	
All options	Availability of third-party land for highway widening
	Grade differences between the east and westbound carriageways which reduces the opportunity for road widening
	Wider traffic impacts due to traffic reassignment
	Complexity of junction layouts and the method of signal control
	Subway structures that may need to be modified
	Roundabout to signalised junction conversions
	Extent of utility diversions and protection works
	Impact on street lighting
	On-street parking will need to be relocated/ removed at certain locations
	Waiting and loading restrictions will need to be changed
	Road safety issues particularly with the busway option
	Adequate cycle priority on side road junctions which are not signalised
	Requirement for side road closures particularly of the busway option
	Adaptability of infrastructure
	Highway infrastructure maintenance liabilities
	Financial viability / sufficient demand to meet operating costs

4.7 Option Sifting

4.7.1 Based on the initial assessment, it was agreed with the Client Group that variant A is not progressed further as it assumes that the BCIP would not be in place. While this provides a baseline from which to further progress the options, given the committed status of the scheme, these options have therefore not been considered appropriate for further consideration. However, all other variants (B, C, D and E variants) have progressed.

5 Preliminary Options Appraisal

5.1 Appraisal Methodology

5.1.1 In line with STAG, the preliminary options appraisal has encompassed appraising each of the options against:

- TPOs
- STAG Criteria: Environment, Safety, Economy, Integration and Accessibility and Social Inclusion
- Established Policy Directives
- Feasibility and Affordability
- Public Acceptability

5.1.2 All elements have been appraised again the STAG seven-point scale as shown in Table 5.1.

Table 5.1: STAG seven-point scale

Major Negative Impact	Moderate Negative Impact	Minor Negative Impacts	No Impact	Minor Positive Benefit	Moderate Positive Benefit	Major Positive Benefit
xxx	xx	x	-	✓	✓✓	✓✓✓

5.1.3 The information contained within the appraisal table (presented below) has been developed through consideration of:

- A **high-level initial logic mapping exercise**, mapping the options against the transport problems, the anticipated transport outcomes, the anticipated wider societal outcomes, and a high-level review of how the interventions may impact on the TPO
- **Existing studies** – drawing on appraisals undertaken to date
- **Benchmarking & case studies** – this has been particularly appropriate e.g., for the active travel measures where step changes are made to the availability and quality of the active travel network
- **Professional knowledge and consensus** – through various internal workshops, where the option impacts have been fully considered by the entire appraisal team

5.1.4 At the Preliminary Options Appraisal stage, the appraisal focusses on a mainly qualitative assessment.

5.1.5 To inform various elements of the appraisal however, additional quantitative analysis has been undertaken. This has included the following elements:

- **Transport Modelling** – using the Aberdeen Sub-Area Model (ASAM). Given the scale of the impacts of the options (developed with the transformational step change design in mind), it was agreed that it would be highly beneficial to understand more quantitatively, the impacts of the options on both general traffic and public transport. Various modelling methodologies were explored to enable the impacts to be understood, recognising the potential for wider strategic re-routeing due to the options. Given this, it was agreed that

the Aberdeen Sub-Area Model (ASAM14) would be used to provide this greater insight. Using ASAM:

- Provides an understanding of the general traffic re-routeing impacts across a much larger area (than e.g., local junction modelling could provide) – this is important given the scale of the proposed options
- Provides a more quantitative understanding of the modal shift impacts of the options via the ASAM demand model
- Provides changes to average journey times relating to both general traffic and public transport
- Provides both general traffic and public transport inputs to TUBA to derive cost benefit ratios for each option
- Provides data to feed into the derivation of Hansen connectivity analysis

- **Connectivity Analysis** – using outputs from the ASAM modelling to inform 'Hansen' accessibility analysis relating to access to employment
- **Economic Benefits of Cycling and Walking** – to understand the economic value of mortality improvements derived from the Health and Economic Assessment Tool (HEAT)
- **Option Costs Estimates** – development of high-level cost estimates for the options (with active travel and bus element of each option estimated separately) to inform the affordability appraisal criteria and feed into the TUBA analysis

5.1.6 It should be noted that ASAM14 reflects the 2014 baseline conditions and public transport services at that time. The road network has altered since then (with the largest change the opening of the Aberdeen Western Peripheral Route) and public transport services will undoubtedly have changed. While the forecast year models for ASAM14 do have this new infrastructure modelled, ASAM14 itself has not been recalibrated to reflect any subsequent altered traffic conditions. The model nevertheless provides useful indicative analysis to inform this preliminary options appraisal, but care should be taken when inferring detail in the outcomes.

5.1.7 It should be noted that the BCIP is included in all ASAM forecast year models as a committed scheme and the ASAM results therefore reflect this infrastructure being in place (and indeed utilised in the options).

5.1.8 In addition, a **Stakeholder and Public Engagement** exercise was undertaken to feed into the acceptability criteria.

5.1.9 These elements of the appraisal are presented in greater detail in the following Appendices of this report:

- Appendix C – ASAM Modelling
- Appendix D – Public Transport Journey Time Analysis
- Appendix E – Strategic Re-routeing
- Appendix F – Economic Impacts (Transport Economic Efficiency analysis)
- Appendix G – Hansen Accessibility

- Appendix H – Option Affordability (capital costs)
- Appendix I – Reallocation of Space
- Appendix J – Public Engagement

5.2 Logic Mapping

5.2.1 An initial high level logic mapping exercise was undertaken to inform the option appraisal process with the logic maps for active travel and bus presented in Figure 5.1 and Figure 5.2 below. Note that the interventions were scored at a very high level against the TPOs at this initial stage, with green indicating a positive impact (the darker the green colour, the more positive), and red indicating a negative impact (the darker the red colour the more negative the impact).

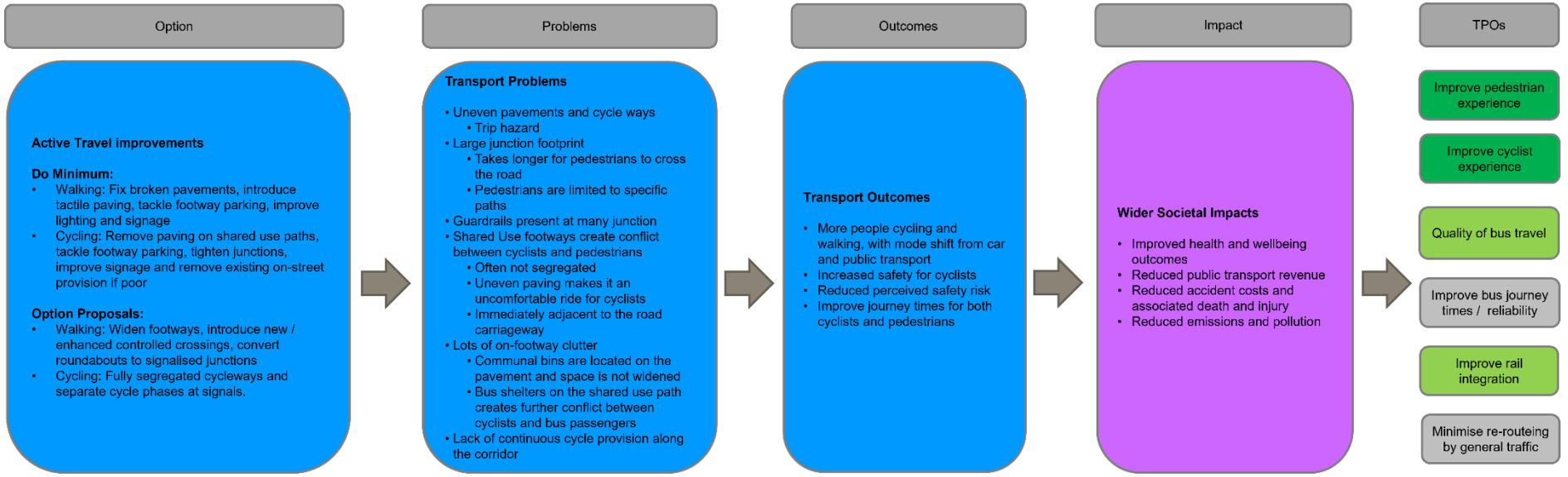


Figure 5.1: Active Travel – Logic Map

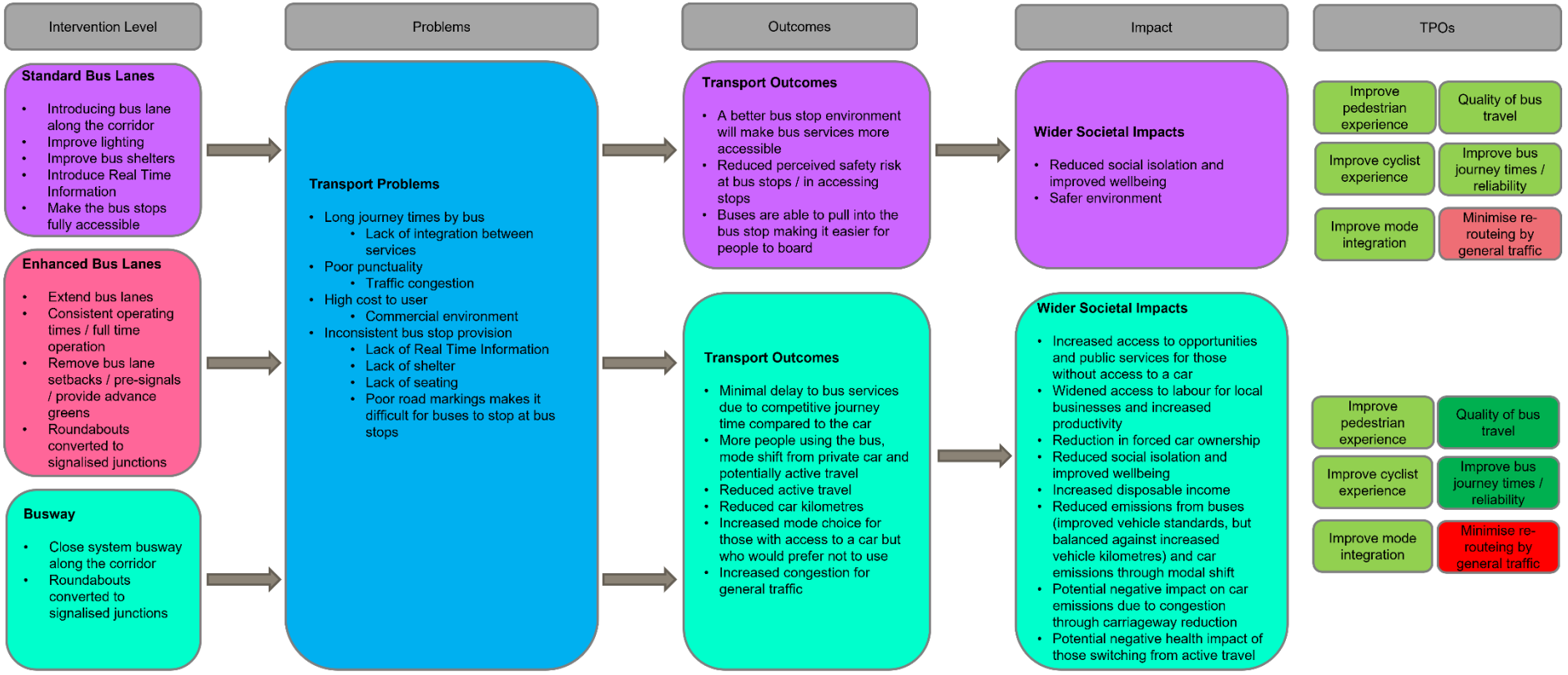


Figure 5.2: Bus – Logic Map

5.3 Options Appraisal

5.3.1 The appraisal of each option is shown in the Appraisal Table below supported by the information in the appendices (referenced within the table).

5.3.2 The appraisal set out in this section discusses the three intervention levels (1, 2 and 3), the four option variants (B, C, D and E), and when combined, the 12 options i.e., Option 1B, Option 1C…. Option 3D, Option 3E.

5.3.3 To avoid unnecessary duplication of text, the table is set out with the three interventions levels across the column headings and the route variants across the rows. Comments which are relevant across more than one intervention levels and / or variants are noted once in merged comments box. Furthermore, comments relevant to one or more variants or interventions levels are also combined in rows or columns as appropriate. Active travel infrastructure forms part of each option (i.e., each combined intervention and variant option e.g., 1B, 2D). As such, it is included in the discussion within the text for each option. However, where there are specific points of note in relation to active travel alone, these have been made in an additional active travel row under the relevant criteria.

5.3.4 It is worth noting that this study was undertaken as the country transitioned out of the COVID-19 pandemic. Consideration has been given within the appraisal to both the potential positive and negative impacts of the pandemic on the viability of the options and their ability to support a ‘green recovery’ from the pandemic and ‘lock-in’ positive pandemic behaviours e.g., increased active travel or reduced trip making. Close monitoring of travel behaviour and trends as the region transitions out of the pandemic will enable an understanding of the potential legacy impacts of the pandemic and enable a robust business case to be developed to allow for appropriate decision making.

Table 5.2: - Appraisal Table - TPOs

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO 1: **Improve the quality of the pedestrian experience, and address the barriers which affect people moving around as pedestrians along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre**	ALL	Previous studies, and the site visits undertaken to inform this work, highlighted poor and sub-standard pedestrian crossing facilities with poor surfacing, sub-standard crossings, non-Equalities Act compliant infrastructure and pedestrian severance along the corridor. Significant severance along sections of dual carriageway was noted, exacerbated by liberal use of pedestrian barriers, hard / soft landscaping, and anti-pedestrian surfacing. The site visit scoring across the route for walking and wheeling (see *A96 Multi-modal Transport Study – Problems and Opportunities Technical Note, Stantec, May 2021*) highlighted that walking and wheeling provision was below satisfactory from Powis Terrace to the A947 at Bucksburn, and from the Craibstone Roundabout to Kintore (where provision was simply lacking). As noted in this report, discussion is made as to 'Do Minimum' measures which could be implemented to improve the pedestrian environment, including: fix broken paving; introduce tactile paving/ dropped kerbs where missing; tackle footway parking; ensure good and consistent lighting levels; declutter footways; improve wayfinding through signage; and consistent use of materials. As part of this study, these Do Minimum measures are assumed to be 'business as usual' and to be implemented by the Council through their ongoing highway maintenance programmes. At present, signage indicates shared cyclists and pedestrian footways from Bank Street (just west of Don Street) to Old Meldrum Road, which is approximately 3km in length, with give-way markings at road entrances. The shared use path then re-joins the A96 corridor on Malcolm Road, to the east of the Bucksburn Roundabout, and stops at Gilbert Road 250 meters to the west. On the eastbound carriageway to the west of the roundabout at A96/Bankhead Avenue and Sclattie Park, a shared use path begins and routes west towards TECA. This section is approximately 1.1km in length and stops at the junction with Dyce Drive, the A96 and Craibstone Drive where it routes north towards the airport. These shared use areas create over 4km of shared footway with the potential for pedestrian and cyclist conflict, often with the shared path immediately adjacent to the live carriageway with no buffer between the path and carriageway creating an unsafe route close to high-speed traffic. The inclusion within all of the variants of a two-way segregated cycle track or one-way with traffic flow cycle tracks will mean there will not be any segments of the corridor indicated as shared use footway where pedestrians and cyclists are sharing the same footway area. This will reduce the risk of pedestrian and cycle conflict along the corridor and allow for improved pedestrian space in and around areas of narrower footways and at bus stops. It will also improve pedestrian access to bus stops. Under all options, signalised junctions along the corridor would be integrated to enable effective pedestrian crossing times within the overall signal cycle time, with maximum time spent waiting at signals to be less than 90 seconds to minimise pedestrians crossing without the green man and reduce the unnecessary safety risk associated with this.		
		If the two-way cycle track were to be implemented, it is envisaged it would route predominantly on the northern (eastbound) side of the carriageway. It is assumed that there would be a number of junction treatments on the opposing (westbound) carriageway to provide an improved pedestrian	Similar to IL1, under IL2, improvements would be made to the pedestrian environment. Measures may additionally include tabletop treatments at junctions to further slow traffic and increase pedestrian safety at side roads.	As the bi-directional busway would be located on one side of the main carriageway (likely the northern side) there may be some increased safety risk to pedestrians accessing the busway bus stops from the southern side of the carriageway with the

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO 1: Improve the quality of the pedestrian experience, and address the barriers which affect people moving around as pedestrians along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre		environment and experience. Under IL1, such treatment would include the tightening of junction geometries to reduce pedestrian time to cross junctions and to slow traffic speeds as they enter and exit side arm roads. If the one-way with flow cycle tracks were implemented, such measures would also be provided to improve the northern (eastbound) pedestrian experience.		need to cross the busway and main carriageway. However, the busway stops themselves would offer a highly accessible boarding and alighting environment with high quality bus shelters to improve the waiting experience. Similar to IL2, under IL3, improvements would be made to the pedestrian environment to increase pedestrian safety. In addition, the inclusion of a busway would require some roundabouts to be converted to signalised junctions (e.g. at Kittybrewster). In these cases, the provision for cyclists and pedestrians would be built into junction design and reduce the distance to navigate the junction (i.e., cyclists and pedestrians would not be required to detour away from the roundabout to cross on a side arm).
		✓✓✓	✓✓✓	✓✓
TPO2: Improve the quality of the cycling experience, and address the barriers which prevent many people cycling along the A96 corridor between Inverurie and Mounthooly roundabout /	ALL	Under all variants and intervention levels, implementation of the following is assumed (as described in Section 4.4): • Between Inverurie and Craibstone roundabout: A part new and part upgraded shared use path, running parallel to the A96 • Between Craibstone roundabout and Mounthooly: A two-way segregated cycle track (provided on one side of the carriageway) **or** a one-way (with traffic flow) segregated cycle tracks on each side of the road (noting the compatibility issues of a two-way track as discussed previously under IL3) This is a significant step change from the existing provision along the corridor, which is either lacking, often shared-use footway on narrow pavements with **street** furniture (bins, guard rails, bus shelters etc.) and often immediately adjacent to the carriageway on roads with fast moving traffic. The active travel track (either the two-way track or one-way tracks) would provide priority for cyclists, in line with the Highway Code, over side roads with side arm junctions 'tightened' to reduce junction flares.		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
Aberdeen city centre	ALL	Following the Guiding Principles as set out in Section 4.3 (which follow Transport Scotland's Cycle by Design[12] guidance), the track will provide: • a safe route which minimises the potential for accidents – a risk which is a key barrier to cycle use and users (research undertaken as part of the *British Social Attitudes Survey* in 2017 found that 62% of people agreed that 'It is too dangerous for me to cycle on the road'[13]). Both the proposed two-way track and one-way with flow tracks are segregated from the main carriageway, and offer space designated for cyclists. This provides a consistent design to avoid ambiguity and is highly likely to address the key barrier of safety which often prevents people from cycling. The route provides improved cycle access to several schools including Kittybrewster Primary School located immediately on the A96 corridor (with the proposed cycling infrastructure routeing past the school likely to encourage cycling to school). As well as two-way or one-way with flow tracks, safe junction crossings (with new Toucan crossings and the conversion of existing crossing facilities to Toucan control with dedicated cycle phases) would be provided which would further increase both real and perceived safety for cyclists along the route. • a coherent network which links the many residential urban communities adjacent to the corridor, both within Aberdeenshire (Inverurie, Kintore and Blackburn) and within Aberdeen. The route would link at Craibstone to existing cycle shared path infrastructure connecting to the airport and TECA, as well as into the Kirkhill Industrial Estate. The proposed two-way or one-way with flow tracks would link to the National Cycle Network 1 route at Bucksburn, with connections to the University of Aberdeen campus at St. Machar Drive. The route would also link to the Kittybrewster Retail Park and provide a connection to George Street, a popular retail centre. • a direct route, along the length of the corridor. Strava data analysed for this study (see the *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note, Stantec, May 2021*) highlighted that cyclists were taking significantly longer routes to access the city centre when compared to the most direct route (e.g. over a kilometre further between Bucksburn and the city centre, over 3km further between Blackburn and the city centre, and over 4km further between Kintore and the city centre). This provision of this direct cycle link along the corridor would reduce journey distances and travel time which can be a barrier to cycling. • appropriate lighting, personal security, environmental quality, and a continuous level of infrastructure provision, likely to increase the attractiveness of the route and attract new users. • a smooth, uninterrupted, and well-maintained surface likely to attract 'non-sports' cyclists • integration with the public transport proposals and would involve additional infrastructure such as bus stop bypasses to ensure additional street furniture does not impact on the cycle route.		

[12] Cycling by Design (transport.gov.scot)

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/724855/british-social-attitudes-survey-2017.pdf

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO2: Improve the quality of the cycling experience, and address the barriers which prevent many people cycling along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre	B, C, D & E			The busway would require the signalisation of some of the large roundabouts on the corridor including those at Kittybrewster and Haudagain. This would be beneficial to cyclists as no circuitous routeing away from the roundabout to crossings on side arms would be required. Other junctions with wide flares would also be redesigned (for instance the A96 junction with Dyce Drive) with again, benefits to cyclists as the cycle track would route more directly through the junction due to changes in stop line positions and reduced side arm flares.
	Two-way cycle track	A two-way segregated track would offer a considerable step change in cycling provision along the corridor and of the two active travel options discussed, two-way track provision (as opposed to one-way with flow tracks) is also more closely aligned with good practice design on a dual carriageway road such as the A96 where traffic speeds are high. The two-way track is more 'space efficient' requiring less land take than the one-way with traffic flow tracks, as only a single buffer strip between the carriageway and track is required (as opposed to two buffer strips on each side of the carriageway). In terms of route maintenance, the two-way track offers quicker, and likely cheaper maintenance requirements given the ability to grit / de-ice / manage vegetation for both directions of the track at once. A two-way track with cyclists traveling in opposing directions having visual contact can also help create a feeling of being part of a cycling community and increase the perceived sense of security and safety of using the route. A key disadvantage of the two-way track is the difficulty in connectivity to and from the track from the south of the A96 (assuming the track was located on the northern side of the carriageway). However, appropriate integrated crossing facilities should enable such movements to be undertaken easily and safely. In addition, it will be more difficult for cyclist to move between the track and the road for cyclists travelling against the flow of traffic (i.e., those travelling out of Aberdeen).		
		✓✓✓		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
	One-way with traffic flow cycle tracks	The one-way with traffic flow cycle track provision on both sides of the carriageway would provide a step change in provision from that at present. However, such provision within the dual carriageway environment would not align as well with good practice. One-way tracks are less space efficient, requiring additional land take to accommodate the two buffer strips required at either side of the carriageway to separate the track from the road. Such tracks, once implemented, are also less flexible to change (as opposed to a two-way track). However, provision of one-way tracks does enable easy connectivity to other cycle routes and makes moving between the track and the road much easier than with a two-way track. A key disadvantage of the one-way track provision is the potential for cyclists to incorrectly use the track in the wrong direction if it is easier than crossing a major road. This can lead to safety risks for cyclists using the track.		One-way with traffic flow cycle tracks not easily compatible with busway level of intervention. As noted in Section 4.4, while it is not impossible to implement one-way with traffic flow cycle tracks with a busway, this would require additional junction complexity and likely cause confusion to all road users due to the number of different directional 'carriageway' lanes across all modes i.e., creating a cross-section with one-way cycle track, two-way road, one-way cycle track, 2-way busway.
		✓✓		-
TPO3: Improve the quality of bus travel in the corridor for all users, enhancing the network and the travel experience both for current bus users and to attract new users	ALL	None of the options seek to improve the bus vehicle itself but all would improve the quality of bus travel in the corridor by providing dedicated priority bus infrastructure that will reduce bus journey times, increase service reliability and punctuality, and offer a mode of transport more competitive with the private car. Overall, all the options will enhance the travel experience for current users and attract new users to the public transport network.		
				The busway design would provide a fully accessible boarding and alighting environment for passengers as it would be easier to achieve layout compliant bus stops into the design of the busway.
	B	Unlike the other variants, variant B does not address the carriageway constraint where the A96 crosses the railway line at Belmont Road / Leslie Terrace. As such, there would be a 'gap' in the bus lanes / busway and the variant would therefore not provide continuous dedicated bus priority between Craibstone and the city centre. As such, the option is likely to provide less enhancement in the overall travel experience when compared to the other options.		
		✓	✓	✓✓
	C	Variant C builds on variant B by addressing the carriageway constraint at Belmont Road / Leslie Terrace through widening of the railway bridge to accommodate a bus lane / busway alongside a general traffic lane (and the proposed active travel provision). As such, there is continuity in the provision of bus priority along the corridor between Craibstone and the city centre. Given this, the option is likely to provide increased enhancement in the overall travel experience when compared to variant B.		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
		✓✓	✓✓	✓✓✓
	D	Variant D provides continuity in bus priority provision along the corridor between Craibstone and the city centre with priority provided along the BCIP scheme to Union Square as opposed to Powis Terrace / Powis Place. For the scheme to be justified, sufficient bus services would be required to re-route into the city centre via the BCIP route. While this would provide enhancements for those with destinations along the Berryden Corridor route, and Union Square etc. any change to the volume of services / service route options on Powis Terrace / Powis Place and George Street / Gallowgate is likely to reduce the experience of the bus network for those boarding or alighting at destinations along that route who would experience a reduction in bus services / a longer walk to access the required services elsewhere.		
		✓	✓	✓
	E	Similar to variant C, variant E addresses the carriageway constraint at the Belmont Road / Leslie Terrace railway bridge. As such, there is continuity in the provision of bus priority along the corridor between Craibstone and the city centre. Given this, the option is likely to provide a similar level of enhancement in the overall travel experience when compared to variant C.		
		✓✓	✓✓	✓✓✓
TPO4: Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times	ALL	The analysis presented in Appendix D (developed from ASAM modelling outputs) shows all intervention levels and route variants providing reductions in bus journey time compared to the Do Minimum. Appendix D presents a comparison of bus and car journey times (in the AM peak) between Craibstone Park & Ride and Aberdeen city centre (these locations have been chosen as the focus of the bus priority measures under all route variants is between these two places). In the Do Minimum situation, the journey time from Craibstone into Aberdeen city centre is nearly an hour quicker by car. With the route variant proposals in place, under the various intervention levels, the journey time by bus reduce by over 20minutes (under Option 3D) and around 10 minutes (under Option 1B) and the gap between bus and car-based journey times has narrowed. While the bus journey time is around 10 to 25 minutes faster (depending on the option) than the Do Minimum journey time, it is however noted that travel by car is still 28-46 minutes faster than by bus.		
	ALL	Inclusion of standard bus lanes (IL1) along the A96 provides some level of bus priority over general traffic by enabling buses to bypass traffic queues. This will reduce bus journey times along the corridor. However, bus stop lines will be set back from junction stop lines meaning buses are in amongst general traffic through junctions and do not get complete priority through signalised junctions. As expected, given the bus lanes stop before the junctions, the outputs from ASAM - see	The inclusion of enhanced bus lanes (IL2) along the A96 provides a good level of bus priority over and above that which could be achieved through standard bus lanes. Enhanced bus lanes provide a dedicated end-to-end bus lane achieved by extending the bus lane to the junction stop lines and providing priority at signals. This provides an increased level of protection against general traffic congestion. As expected, the outputs	A busway would offer a 'closed' system, only accessible to buses and therefore highly unlikely to be abused by general traffic. Therefore, the implementation of a busway would provide the highest level of protection for buses against general traffic congestion. The busway is unlikely to be abused by other traffic. This would ensure bus times and reliability, ensuring service punctuality. As

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO4: Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times		Appendix D - in relation to bus journey times show IL1 providing lower journey time benefits than IL2 or IL3 (often around only 50% of these journey time reductions).	from ASAM - see Appendix D - in relation to bus journey times show IL2 provides greater journey time benefits than IL1 (often double the journey time reductions). Journey time reductions are generally marginally lower than under IL3.	such, there is likely to be a greater 'narrowing of the gap' between bus and car-based journey times along the corridor. As expected, given the closed bus network offered by the busway and priority at signals, the outputs from ASAM in relation to bus journey times show IL3 provides greater journey time benefits than IL1 (often double the journey time reductions). Journey time reductions are generally marginally greater than under IL2.
		Bus lanes can, and are, easily abused, with cars using the bus lanes as a general traffic lane, and sometimes parking in the bus lane. This would negate some of the journey time benefits of the bus lanes and also bus journey time reliability. Bus lanes which operate over standardised hours over the whole corridor (and indeed standardised over all bus lanes in the city), or with 24hr operation, are less likely to cause confusion to drivers which could help minimise inappropriate use of the lanes. Misuse of bus lanes by unauthorised vehicles can largely be overcome through CCTV enforcement with cameras located either on the roadside or on-buses.		
	B	Variant B does not propose any additional infrastructure at the constrained section of carriageway between Clifton Road and Bedford Road (where the A96 crosses the railway line at Belmont Road). At this location, to enable the provision of a continuous cycle provision through this section, there is not sufficient space to incorporate bus priority unless general traffic were banned. As such, the option includes the use of traffic 'gating' to relocate queues (and congestion) out of the narrower section of corridor and so create free flow conditions where buses can operate without unnecessary delay. A bus lane is introduced alongside the relocated queue to avoid buses getting delayed upstream of the gating point. The outputs from ASAM, as shown in Appendix D in relation to bus journey times for the future year of 2037, show: • **Service 10** (Inverurie - Aberdeen): journey times reducing by up to **15%** from the Do Minimum journey time, equating to over 13 minutes of journey time saving. The greatest saving is made in the PM period in the outbound direction (i.e., Aberdeen to Inverurie) under Option 3B • **Service 17** (Dyce - Aberdeen): journey times reducing by up to **10%** from the Do Minimum journey time, equating to over 9 minutes of journey time saving. The greatest saving is made in the PM period in the outbound direction (i.e., Aberdeen to Dyce) under Option 3B • **Service 727** (Aberdeen Airport - Aberdeen): journey times reducing by up to **30%** from the Do Minimum journey time, equating to over 16 minutes of journey time saving. The greatest savings are made in the AM period in the outbound direction (i.e., Aberdeen to airport) and in the PM period in the inbound (i.e., airport to Aberdeen) direction under Option 3B		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO4: Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times		• **Service X20** (Kintore - Aberdeen): journey times reducing by up to **22%** from the Do Minimum journey time, equating to nearly 17 minutes of journey time saving. The greatest savings are made in the AM and PM period in the outbound direction (i.e., Aberdeen to Kintore) under Option 3B Compared to the other route option variants, variant B never provides faster bus journey times across these services.		
		✓	✓✓	✓✓
	C	Variant C proposes new infrastructure at the constrained section of carriageway between Clifton Road and Bedford Road (where the A96 crosses the railway line at Belmont Road) through the widening (through replacement) of the existing bridge over the railway line. This would allow for continuous bus priority provision through this section of carriageway. Continuous bus priority along the corridor would lead to reduced journey times and improved bus reliability and punctuality. The outputs from ASAM, as shown in Appendix D in relation to bus journey times for the future year of 2037, show: • **Service 10** (Inverurie - Aberdeen): journey times reducing by up to **15%** from the Do Minimum journey time, equating to over 13 and a half minutes of journey time saving. The greatest saving is made in the PM period in the outbound direction (i.e., Aberdeen to Inverurie) under Option 3C • **Service 17** (Dyce - Aberdeen): journey times reducing by up to **18%** from the Do Minimum journey time, equating to over 16 minutes of journey time saving. The greatest saving is made in the PM period in the outbound direction (i.e., Aberdeen to Dyce) under Option 3C • **Service 727** (Aberdeen Airport - Aberdeen): journey times reducing by up to **43%** from the Do Minimum journey time, equating to over 23 minutes of journey time saving. The greatest savings are made in the PM period in the outbound direction (i.e., Aberdeen to airport) and in the PM period in the inbound (i.e., airport to Aberdeen) direction under Option 3C • **Service X20** (Kintore - Aberdeen): journey times reducing by up to **21%** from the Do Minimum journey time, equating to 16 and a half minutes of journey time saving. The greatest savings are made in the PM period in the outbound direction (i.e., Aberdeen to Kintore) under Option 3C Service 17 maintains its route under all option variants (i.e., it is not re-rerouted down the BCIP scheme as proposed under variant D). Comparison of the different route variants for this common service shows route variant C providing the greatest journey time reduction. The journey time reduction is slightly greater than that achieved for variant E but is over 40% and 25% greater than that achieved under variant B in the outbound and inbound directions respectively. Junction time reductions are also over 55% and 30% greater than that achieved under variant D in the outbound and inbound directions respectively.		
		✓✓	✓✓✓	✓✓✓
	D	Variant D proposes bus priority along the length of the BCIP from Kittybrewster to Skene Square and onwards on Woolmanhill / Denburn Road to the railway station / bus station. This route would provide quick access to the rail and bus stations at Union Square from locations along the A96 corridor north of Kittybrewster, but journey times would only be reduced for those services which were deemed appropriate to re-route. The		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO4: Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times		decision on service re-routing would be commercially driven and dependent on existing bus routeing and passengers served – it may be more appropriate for longer distance or express services. Therefore, while there would be improvements to bus journey times and reliability, the improvement would only apply to re-routed services. The outputs from ASAM, as shown in Appendix D in relation to bus journey times for the future year of 2037, show: • **Service 10** (Inverurie - Aberdeen): journey times reducing by up to **16%** from the Do Minimum journey time, equating to over 12 minutes of journey time saving. The greatest saving is made in the inter-peak period in the outbound direction (i.e., Aberdeen to Inverurie) under Option 3D • **Service 17** (Dyce - Aberdeen): journey times reducing by up to **9%** from the Do Minimum journey time, equating to over 7 and a half minutes of journey time saving. The greatest saving is made in the PM period in the inbound direction (i.e., Dyce to Aberdeen) under Option 2D • **Service 727** (Aberdeen Airport - Aberdeen): journey times reducing by up to **55%** from the Do Minimum journey time, equating to over nearly 30 minutes of journey time saving. The greatest savings are made in the PM period in the outbound direction (i.e., Aberdeen to airport) and in the PM period in the inbound (i.e., airport to Aberdeen) direction under Option 3D • **Service X20** (Kintore - Aberdeen): journey times reducing by up to **36%** from the Do Minimum journey time, equating to 27 and a half minutes of journey time saving. The greatest savings are made in the PM period in the outbound direction (i.e., Aberdeen to Kintore) under Option 3D While Service 17 maintains its route under all option variants (i.e., it is not re-rerouted down the BCIP scheme under variant D), for the purposes of modelling this variant in ASAM, Services 10, 727 and X20 were all assumed to re-route to use the BCIP to access Union Square. Comparison of the different route variants for these service shows route variant D clearly provides the greatest journey time reduction for the re-routed services. This is not unexpected given the more direct routeing to Union Square. The journey time reduction on these re-routed services: • compared to variant B is up to 17% quicker for Service 10, and up to around 45% quicker for Service 727 and Service X20 • compared to variant C is up to 13% quicker for Service 10, up to 20% quicker for Service 727, and up to 40% quicker for Service X20 • compared to variant E is up to 17% quicker for Service 10, up to around 45% quicker for Service 727 and Service X20		
		✓	✓✓✓	✓✓✓
	E	Like route variant C, variant E proposes new infrastructure at the constrained section of carriageway between Clifton Road and Bedford Road (where the A96 crosses the railway line at Belmont Road) through the widening of the existing bridge over the railway line. Similar to variant C, this would allow for continuous bus lane provision through the currently constrained section of carriageway. Continuous bus priority along the corridor would lead to reduced journey times and improved bus reliability and punctuality. The outputs from ASAM, as shown in Appendix D in relation to bus journey times for the future year of 2037, show similar, but slightly less beneficial, journey time reductions than variant C. This not unexpected given both route variants include the widening of the railway bridge to		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
		enable continuous provision of bus priority along the corridor. Variant E would be expected to provide slightly less reduced journey times, compared to variant C, given the use of the Great Northern Road (and not the BCIP) between Kittybrewster roundabout and Clifton Road, making the route slightly longer.		
		✓✓	✓✓✓	✓✓✓
TPO5: Improve active travel and bus travel integration with, and access to, rail services in the corridor	ALL	**Active Travel:** Railway stations are located on the corridor at Inverurie, Kintore, Dyce, and Aberdeen. Both proposed segregated cycle tracks (two-way or one-way with flow) would link at Craibstone to existing shared path infrastructure linking to the airport and Dyce station and as such would provide an increased level of cycle and rail integration. However, given the existing stations at Inverurie and Kintore, this is likely to benefit those residing in Blackburn only. There will also be benefit to those studying at Scotland's Rural College (SRUC) campus to the south-east of the Craibstone roundabout who access the area by rail and then cycle, as well as increasing access to the rail network by bike for those in the residential areas (both existing and proposed) at Rowett South and Craibstone North. At the southern end of the corridor, the proposed cycle track provision provides linkages to a recommended cycle route on George Street connecting down to Schoolhill. There is however no defined cycle infrastructure providing a direct link from here to Aberdeen bus or railway station.		
	B, C and E	Variants B, C and E offer no improved bus connectivity to the railway stations other than the faster journey times along the A96 the corridor by bus which would provide quicker access by bus to the rail network overall. Bus services 10, 37, X27 and the 727 route along the A96 corridor and serve Aberdeen railway and bus stations and, as such, passengers would see reduced journey / access times in connecting to the rail network in Aberdeen. Similarly, bus services 10 and 37 connect to Inverurie and Kintore railway stations and may experience reduced journey time by bus to these stations, dependent on the trip origin.		
		✓	✓	✓
	D	Variant D provides bus priority on a more direct route along the BCIP / Woolmanhill / Denburn Road to Aberdeen railway and bus station at Union Square. Route variant D therefore provides good integration between bus and rail for those services which would re-route to use the proposed bus priority provided under this variant on the Berryden Corridor.		
		✓✓	✓✓	✓✓
	ALL	The inclusion of standard bus lanes along the A96 is likely to have minimal impact on junction capacity as the bus lane will be set back an appropriate distance from the junction stop line. However, between Craibstone and Kittybrewster (and south of Kittybrewster dependent on the	The inclusion of enhanced bus lanes will require junctions to be redesigned and a new method of signal control implemented to allow bus lanes to be extended to junction stop lines.	The implementation of a busway would provide the highest level of protection for buses against general traffic congestion and would require junctions to be re-engineered to accommodate the busway – including signalisation of small/medium sized

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO6: Manage general traffic to minimise traffic re-routeing onto secondary and local routes as defined by the North East Roads Hierarchy		variant) there will be reduced link capacity as the bus lane removes the nearside traffic lane. This is likely to displace and lengthen traffic queues which potentially block-back into the upstream junction causing increased delay for general traffic along the corridor. Traffic flow data under the Do Minimum situation and each intervention level and route variant (presented in Appendix E) shows 24hr traffic flows along the A96 are reduced by up to 5% between Craibstone and Kittybrewster roundabout under IL1 (equating to around 2,500 vehicles). This reduction is far lower than that seen under IL2 and IL3, where the reduction is around 30% under IL2 (enhanced bus lanes) and up to 34% under IL3 (busway).	Junction capacity for general traffic will be reduced and this is likely to displace and lengthen traffic queues which potentially block-back into the upstream junction causing increased delays for general traffic along the corridor – likely to be more significant than under IL1. Between Craibstone and Kittybrewster (and south of Kittybrewster dependent on the route variant) there will also be reduced link capacity as the bus lane removes the nearside traffic lane. As noted in the column to the left in relation to IL1, traffic flow data for the Do Minimum situation and each intervention level and route variant shows 24hr traffic flows along the A96 are reduced by around 30% between Craibstone and Kittybrewster roundabout under IL2 (equating to just under 15,000 vehicles). This reduction is far greater than that seen under IL1 but only marginally less than that seen under IL3 (busway).	roundabouts and part signalisation of large roundabouts. As with IL2, junction capacity for general traffic will be reduced and this is likely to displace and lengthen traffic queues which potentially block-back into the upstream junction causing increased delays for general traffic along the corridor – likely to be more significant than under IL1 and IL2. Between Craibstone and Kittybrewster (and south of Kittybrewster dependent on the route variant) there will also be reduced link capacity as the bus lane removes the nearside traffic lane. There may be a requirement for side road closures as part of the busway implementation. These closures are likely to cause localised traffic re-routeing. Note that the traffic modelling undertaken did not, at this stage, include any side road closures. This would need to be more fully considered during the detailed design stage should the busway be progressed. As noted in the columns to the left in relation to ILs 1 and 2, traffic flow data under the Do Minimum situation and each IL and route variant shows 24hr traffic flows along the A96 are reduced by up to 34% between Craibstone and Kittybrewster roundabout under IL3 (equating to just over 15,000 vehicles). This is reduction is far greater than that seen under IL1 but only marginally more than that seen under IL2 (enhanced bus lanes).

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO6: Manage general traffic to minimise traffic re-routeing onto secondary and local routes as defined by the North East Roads Hierarchy		Both bus lane options could be implemented progressively allowing traffic delay to be managed avoiding significant issues arising. Over time the number, length and operating hours of these bus lanes could be changed to more closely match the modal shift away from the car and progressively ramp up priority levels as general traffic demand reduces. This adaptability could prevent a large initial negative response to the scheme which could put the measures at risk.		The busway option would be more permanent than the bus lane interventions and would be less easy to adapt once implemented. As such, it would be harder to make future changes to the scheme to prevent undesirable general traffic routeing.
	B	Variant B assumes no road widening at the Belmont Road railway bridge with traffic 'gating' required which may cause delay and general traffic rerouting and reassignment with impact on local roads. Traffic flow data under the Do Minimum situation and each intervention level and route variant (presented in Appendix E) shows, on the A96: • Similar traffic flow reductions to the other variants between Craibstone and Kittybrewster roundabout • Less pronounced flow reduction south / east of Kittybrewster compared to variants C and E but a greater flow reduction than under variant D. This is as to be expected given that variant D routes the bus priority measures along the BCIP and therefore does not impact as greatly on the A96 south of the BCIP / Clifton Road junction. Strategic routeing plots from ASAM showing flow differences across the entire Aberdeen modelled area, as shown in Appendix E, show: • a reduction in flow on the A96 in both directions, with the most significant flow reduction on the A96 between Dyce and Aberdeen, however there is still a reduction on the A96 between Kintore and Dyce • strategic re-routing with additional flows observed on other key routes into Aberdeen • Key flow increases: ○ on the AWPR north of Dyce and into the city via the A92 to the north of Aberdeen ○ on the roads running through Kingswells and Skene to the west of Aberdeen and into the city via the A944		
		×	××	××
	C	Variant C builds on variant B by widening the carriageway and removal of the existing constraint at the Belmont Road railway bridge. As such, no traffic 'gating' would be required as the bus lane or busway would be continuous through this section giving buses a greater level of priority. Traffic flow data under the Do Minimum situation and each intervention level and route variant (presented in Appendix E) shows, on the A96: • Similar traffic flow reductions to the other variants between Craibstone and Kittybrewster roundabout • A much greater flow reduction south / east of Kittybrewster compared to the variants B and D, but similar to variant E. This is as to be expected given that variants C and E propose similar measures between the BCIP/ Clifton Road junction and Mounthooly roundabout. Strategic routeing plots from ASAM showing flow differences across the entire Aberdeen modelled area, as shown in Appendix E, show: • similar flow changes as noted (above) under variant B, over much of the network		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
TPO6: Manage general traffic to minimise traffic re-routeing onto secondary and local routes as defined by the North East Roads Hierarchy		• notable changes from variant B with flow increases in the northeast of Aberdeen noted on Esplanade whereas this was a flow reduction in variant B. This is potentially showing that congestion elsewhere on the network has led to increased flow on the A92 corridor.		
		x	xxx	xxx
	D	Variant D involves implementing bus priority on one of the general traffic lanes of the BCIP. The BCIP scheme provides a dual carriageway from Skene Square in the city centre to Kittybrewster roundabout by dualling existing roads and new road construction. Reconfiguring the scheme to create a dedicated bus lane or busway along the scheme's length, essentially halving the capacity of general traffic, is likely to create significant traffic rerouting. Traffic flow data under the Do Minimum situation and each intervention level and route variant (presented in Appendix E) shows, on the A96: • Similar traffic flow reductions to the other variants between Craibstone and Kittybrewster roundabout • A much smaller flow reduction south / east of Kittybrewster compared to the variants B, C and E. This is as to be expected given that variant D routes the bus priority measures along the BCIP and therefore does not impact as greatly on the A96 south of the BCIP/Clifton Road junction. There is in fact, on the A96 at Powis Place and Powis Terrace, a 2-3% flow *increase* in Option 1D and up to 6% flow *increase* in Option 2D, likely due to traffic re-routeing onto the A96 instead of the BCIP due to the loss of general traffic capacity on the BCIP to provide the bus priority proposed Strategic routeing plots from ASAM showing flow differences across the entire Aberdeen modelled area, as shown in Appendix E, show: • Similar flow changes as noted (above) under variants B and C over much of the network • Flow reductions on Woolmanhill and Denburn Road, due to the reduced capacity of the Berryden Corridor • Increased traffic on St. Machar Drive and King Street, likely due to traffic re-routeing due to the reduced capacity on the Berryden Corridor as vehicles seek alternative routes into the city centre		
		xx	xxx	xxx
	E	Similar to the other variants, between Craibstone roundabout and Kittybrewster roundabout, and between Kittybrewster roundabout and Clifton Road, the variant proposes buses exit Kittybrewster roundabout onto the existing section of the Great Northern Road via a bus gate that will prevent general traffic using this route. The option would therefore have a reduced impact on general traffic (on the BCIP scheme) and there is likely to be reduced general traffic re-routeing as a result. However, at the southern end (BCIP / Clifton Road junction), the option proposes bus access back onto the A96 at Powis Terrace via another bus gate and where buses will be given a dedicated green within the signal plan, to access the bus priority measures proposed along Powis Terrace. This is likely to delay general traffic. Similar to variant C, variant E includes the widening of the carriageway at the Belmont Road railway bridge. No traffic 'gating' (as proposed under variant B) would be required as the bus lane or busway would be continuous giving buses priority through the entire section. Traffic flow data under the Do Minimum situation and each intervention level and route variant (presented in Appendix E) shows, on the A96:		

Criteria	Route Variant	Intervention Level 1 (IL1): Standard Bus Lanes and active travel route provision	Intervention Level 2 (IL2): Enhanced Bus Lanes and active travel route provision	Intervention Level 3 (IL3): Busway and active travel route provision
		• Similar traffic flow reductions to the other variants between Craibstone and Kittybrewster roundabout • A much greater flow reduction south / east of Kittybrewster compared to the variants B and D, but similar to variant C. This is as to be expected given that variants C and E propose similar measures between the BCIP/ Clifton Road junction and Mounthooly roundabout Strategic routeing plots from ASAM showing 24hr flow differences across the entire Aberdeen modelled area, as shown in Appendix E, show: • similar flow changes as noted under variants B and C above over much of the network		
		xx	xxx	xxx

Table 5.3: - Appraisal Table – STAG Criteria

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Environment	ALL	**Active Travel:** • Mode switch from car to active travel would reduce traffic related carbon and other harmful emissions. This would support the Scottish Governments Climate Change Bill which sets a 2045 target for net zero emissions • The provision of a continuous active travel route from Inverurie to Mounthooly is likely to provide a number of localised community improvements along its length and would help target shorter distance 'everyday' trips – these account for a large proportion of daily trips within Scotland with the 2018 Scottish Transport Statistics[14] stating that 18% of journeys made are less than 1km, and a further 23% are under 3km. Therefore, over 40% of all journeys are less than 3km and could be made by active travel if suitable routes and facilities were available. Aberdeen is a compact city with high potential for increased walking and cycling. • Greater number of trips made by active travel modes would have a positive impact on health and well-being. Such benefits include health benefits from increased physical activity and journey quality (see Appendix F for greater detail) • The provision of a fully segregated route would generate a safer perception of cycling and is likely to encourage a greater number of people to travel actively. Research undertaken as part of the *British Social Attitudes Survey* in 2017 found that 62% of people agreed that 'It is too dangerous for me to cycle on the road'[15]		

[14] https://www.transport.gov.scot/media/46165/sct01193326941.pdf

[15] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/724855/british-social-attitudes-survey-2017.pdf

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Environment		• Potential to 'lock-in' the benefits of increased active travel, both for leisure and commuting purposes, experienced during the COVID-19 pandemic and support a 'green recovery' from the pandemic • The provision of connected active travel provision along the corridor would tie into Aberdeen's strategic city-wide Green Space Network (GSN) connecting natural green and blue spaces and habitats to each other. There are areas of GSN from Aberdeen city centre to Bucksburn and from Bucksburn to Blackburn. It covers a large portion of the study area from the A90 westwards to the city boundary, is present east and west of the A96 between the Haudagain Roundabout and the Bucksburn Roundabout and runs northwards from the Bucksburn Roundabout towards Dyce and south towards Sheddocksley. • While the bus priority interventions consider reallocation of road space and do not generate any significant additional 'tarmac' or road widening, to accommodate the active travel proposals the carriageway requires widening at points along the full length, and specifically along the rural section west of Craibstone where, at present, there is no cycle or walking provision adjacent to the carriageway. This will impact on the environment at these locations with an impact on the embedded carbon of the scheme due to construction. **Bus:** • Increased bus priority along the corridor offering reliable services has the potential to radically alter perceptions of bus travel. This could significantly help towards achieving a 50:50 mode share target for sustainable transport, in turn reducing car kilometres and hence local and global emissions. This shift is likely to be greatest for IL 2 and 3 where the interventions provide increased priority for buses through junctions and therefore are more likely to provide the greatest journey time and reliability benefits, with IL3 (the busway) offering the greatest reliability through a dedicated and 'closed' system. • There may be some health disbenefits if current active travel users switch to using the bus (e.g. switching from a full 5km cycle (with the associated health benefits) to using the bus instead with only walking or cycling part of the trip to and from the bus stops and the origin/destination) but given the current low level of cycling within the city this impact will be marginal • The COVID-19 pandemic has severely impacted bus passenger numbers and the number of operating services. In Scotland, concessionary bus patronage fell to around 20% of 2019 levels during the initial stages of the pandemic, only recovering to around 50% of pre-pandemic levels in 2020[16]. In Autumn 2021, concessionary bus journeys were still down by 35% compared to pre-pandemic levels[17]. Improving the bus network has the potential to help 'build back greener' as the region emerges from the pandemic. • The potential widening of the carriageway to provide for two carriageway lanes in both direction (one for general traffic and one for bus priority) between Printfield Walk and Kittybrewster roundabout will have an environmental impact in the area during construction with noise and vibration impacts • IL1 and IL2 will have a reduced environmental impact during construction compared to the IL3 (busway) which will require a greater re-working of the carriageway space to enable the two-way busway to be implemented on one side of the carriageway		

[16] Transport use, health and health inequalities: full report (publichealthscotland.scot)

[17] COVID-19 Transport Trend Data - 30 August - 5 September 2021 | Transport Scotland

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Environment		Mode switch from car to either bus or active travel would reduce traffic related levels of pollutants. This would have a greater impact in areas within the city centre where there are air quality issues. There is an existing Air Quality Management Area (AQMA) in the city including Victoria Road, Union Street, King Street, Trinity Quay, Virginia Street, Commerce Street, Guild Street, Holburn Street and West North Street. There is a further AQMA on Anderson Drive extending from Bridge of Dee to the junction of Auchmill Road and Howes Road and is within the study area from just north of the junction with Midstocket Road and North Anderson Drive. Any reduction in traffic along the A96 route and into the city centre would help improve air quality in these designated AQMA areas. However, increased congestion on the A96, or on surrounding roads due to the proposals may increase emissions and pollutants in these areas, and traffic rerouting onto other roads may disperse the issue across a wider area, if people do not switch from the car to sustainable modes. It is noted that the presence of the Scheduled Monument Aberdeenshire Canal (remains of) on Station Road in the Woodside area would require consent from Historic Environment Scotland for any change close to the monument due to the proposals.		
	B	Variant B does not address the road constraint at the railway bridge at Belmont Road, and does not provide continuous bus priority the full length of the corridor from Craibstone to Mounthooly. As such, this option is likely to provide the lowest improvement in bus journey time and reliability across the route variants. Given this, the modal shift to the bus, and hence positive environmental impacts from this, under this variant is also anticipated to be the lowest of all options. The option does however generate congestion and traffic re-routeing. This has resulted in strategic re-routing across the network, as discuss against TPO6 above, resulting in longer distance journeys which leads to increased fuel costs. There is a carbon impact associated with the additional fuel costs and the economic appraisal presented in Appendix F highlights the greenhouse gas emissions impact ranging from a £-0.7m disbenefit under Option 1B to a £-5.1m disbenefit under Option 3B.		
		✓	✓✓	✓✓
	C	As variant C removes the carriageway constraint at the Belmont Road railway bridge, enabling continuous bus lane / busway provision from Craibstone to Mounthooly roundabout, the modal shift to the bus, and hence positive environmental impacts from this under this variant is anticipated to be greater than variant B. However, the widening (through replacement) of the railway bridge means the variant will have a greater carbon construction footprint than variant B. As noted above for variant B, variant C also generates congestion and traffic re-routeing which leads to increased fuel costs and hence increased greenhouse gas emissions. The economic appraisal presented in Appendix F highlights greenhouse gas emissions impact ranging from a £-0.6m disbenefit under Option 1C to a £-5.5m disbenefit under Option 3C.		
		✓✓	✓✓✓	✓✓✓
	D	Variant D provides continuous bus priority from Craibstone roundabout to Aberdeen bus / rail stations at Union Square. While the provision of continuous bus priority is likely to create modal shift, there will still be bus services using the A96 corridor between Clifton Road and Mounthooly roundabout which would not benefit from the continuity of the bus priority. The extent of the benefit would be highly dependent on		

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
		the number of services which chose to re-route into the city centre via the BCIP scheme, and the potential impacts on patronage because of this. Given this, the modal shift likely to be achieved under this variant, and hence positive environmental impacts from this, is anticipated to be the lower than variants C and E but greater than Option B. As noted above for variants B and C, variant D also generates congestion and traffic re-routeing which leads to increased fuel costs and hence increased greenhouse gas emissions. The economic appraisal presented in Appendix F highlights greenhouse gas emissions impact ranging from a £-0.8m disbenefit under Option 1D to a £-8.7m disbenefit under Option 3D. These are the greatest greenhouse gas disbenefits of all variants.		
		✓	✓	✓✓
	E	As with variant C, variant E removes the carriageway constraint at the Belmont Road railway bridge, enabling continuous bus lane / busway provision from Craibstone to Mounthooly roundabout, the modal shift to the bus, and hence positive environmental impacts from this, under this option is anticipated to be greater than variant B but similar to variant C. As noted for variant C above, the widening (through replacement) of the railway bridge means the variant will have a greater carbon construction footprint than variant B. As noted above for the other variants, variant E also generates congestion and traffic re-routeing which leads to increased fuel costs and hence increased greenhouse gas emissions. The economic appraisal presented in Appendix F highlights greenhouse gas emissions impact ranging from a £-0.6m disbenefit under Option 1E to a £-5.5m disbenefit under Option 3E (this is similar to Options 1C and 3C)		
		✓✓	✓✓✓	✓✓✓
	ALL	**Active Travel:** • The proposed active travel route (either as a segregated two-way track or as a segregated one-way with traffic flow tracks) offers much improved safety for cyclists. In the case of the two-way track, removing cyclists from the carriageway or removing cyclists from being immediately adjacent to the carriageway (as is the case along parts of the corridor where signage notes shared-path provision adjacent to the 40mph carriageway), will reduce the likelihood of collisions involving cyclists with cars / HGVs. • Casualty rates per million passenger miles by user type highlights that cyclists, and those on foot are far likelier to be a casualty or a fatality than those travelling by car or bus[18]. In fact, cyclists are over 23 times more likely to be a casualty, and 16 times more likely to be a fatality		

[18] Transport Statistics GB (2017), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/744077/reported-road-casualties-annual-report-2017.pdf

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Safety		on the road network than those travelling by car. Mode switch from car to segregated active travel modes would provide reductions in car trips and associated accidents – especially given the segregated nature of the route. • Cycle accident data (covering 2015-2019) analysed and presented in *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note, Stantec, May 2021* shows a greater number of cycle accidents in the city area, not unexpected given the higher traffic volumes. There are a cluster of accidents at Mounthooly roundabout (approximately half of which were classed as severe), around the junction of the A96 / Belmont Road, and around the A96 / A947 junction at Bucksburn. Segregated facilities along the A96 route would help reduce the likelihood of these accidents involving cyclists • Providing a segregated cycle track (either as a segregated two-way track or as segregated one-way with traffic flow tracks) which is clearly delineated to keep cyclists and pedestrians separate, would also reduce the risk of cyclist and pedestrian collisions and as such, improve the safety and attractiveness of both modes of active travel • If segregated one-way with traffic flow tracks were implemented, cyclists may incorrectly use the tracks in the wrong directions if it is easier than crossing the A96 carriageway. This would lead to an increased safety risk for cyclists using the infrastructure • There may be some increased safety risk if the segregated two-way track were implemented given the need to move between the cycle track and the road, which would be more difficult for cyclists travelling against the flow of traffic • There is likely to be an increased perceived feeling of safety and security if the segregated two-way track were implemented given the dedicated cycling 'carriageway' and the opportunity to interact with cyclists traveling in the opposite direction • There may be some increased safety risk to cyclists on the segregated two-way track if they were dazzled by the headlights of on-coming motor vehicles on the road. This is less likely to be an issue in the urban lit areas • Safety, and the perceptions of safety, surrounding active travel schemes is likely to improve as a critical mass is established and such this travel behaviour is 'normalised'		
Safety		**Bus:** Accident data (covering 2015-2019) analysed and presented in *A96 Multi-modal Transport Study - Problems and Opportunities Technical Note, Stantec, May 2021* shows: • There is a cluster of accidents at Mounthooly roundabout and close to the junction of the A96 at the Powis Terrace junction with Leslie Road and Belmont Road around where the carriageway crosses the railway line • A cluster of accidents just south of the A96/A947 roundabout in the vicinity of the A96 / Inverurie Road junction, including one fatal accident • A cluster of accidents immediately south of Haudagain roundabout on the A92 • A cluster of accidents on the A96 at Broomhill roundabout to the south of Kintore A switch to bus travel from the car would reduce traffic on and around the corridor and the associated number of accidents. The scale of this change would depend on the extent of the modal shift from car achieved – likely to be greater for IL 2 and 3 where the journey time by bus will be shorter given the increased level of bus priority delivered. Travel by bus is also safer than travel by car, bicycle and indeed as a pedestrian.		

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Safety		IL1, as discussed in the appraisal against TPO4, generates the lowest travel time reductions across all route variants. As such, it is likely to generate the lowest modal shift to bus travel, and therefore the lowest reduction in accident benefits from any shift away from car travel.	IL2, as discussed in the appraisal against TPO4, generates much more significant travel time reductions across all route variants when compared to IL1. It is likely to generate more significant modal shift to bus travel, and as such, a much greater reduction in accident benefits from this shift away from car travel.	IL3, as discussed in the appraisal against TPO4, generates much more significant travel time reductions across all route variants when compared to level 1 and slightly greater reductions when compared to level 2. As such, it is likely to generate more significant modal shift to bus travel compared to level 1 and similar to level 2. Reduction in accident benefits from this shift away from car travel would be similar to that under level 2. There is a potentially greater road safety risk to pedestrians due to the non-conventional road layout of a busway. The Swansea Ftrmetro scheme involved substantial changes to the road network which included converting some highways to one-way for cars to provide a segregated two-way busway. The new layout of the road created a counterintuitive layout for pedestrians. This unfortunately resulted in two fatalities[19] which led to the removal of the busway as the road layout was concluded to be a factor in their death.
		✓	✓✓	✓✓
	ALL	To provide quantitative analysis to the Economy criteria appraisal, the monetised economic impacts of all options has been estimated for road traffic, public transport and active travel, and are presented in full in Appendix F and summarised here. The economic analysis has been undertaken: • **for road and public transport modes:** using the Departments for Transport's (DfT) TUBA (Transport User Benefit Appraisal) software to generate Travel Economic Efficiency (TEE) impacts and, when combined with scheme costs, to provide an indication of the benefit to cost ratio (BCR) for each option		

[19] https://www.bbc.co.uk/news/uk-wales-south-west-wales-34464221

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Economy		• **for active travel modes:** using the DfT's latest Active Mode Appraisal Toolkit (AMAT), which is a spreadsheet-based tool for estimating the costs and benefits of walking and cycling interventions (used here for estimating cycling benefits). In addition, further work has been undertaken to consider the potential travel time savings to cyclists drawing on data from Strava Metro It is important to recognise that the quantitative economic impacts presented here only represent a part of the overall appraisal picture and overly focusing on the BCRs generated by the options as a means of assessing the value of each option is not advised. The traditional TEE analysis focusses on travel time benefits and, as such, the reallocation of road space (as proposed under all options to varying degrees) creates significant disbenefits to general traffic when measured using this criterion. In addition, the ASAM14 modelling tool is not particularly sensitive to modal choice, and large improvements in bus journey times do not necessarily translate to proportionate modal shift within the model. The outcome of this is that the modelling results and subsequent economic impacts presented in this section and in Appendix F represent a *worst-case* scenario in terms of journey times and economic impacts (in reality, it is likely that a greater number of car trips would convert to public transport). To aid understanding of the economic impacts, while an overall BCR figure is presented for each option encompassing the general traffic and public transport benefits and costs, to highlight the specific benefit to buses, a purely public transport based BCR is also presented. This has been derived using just the public transport benefits and public transport infrastructure costs related to the bus priority measures proposed under each option (note that a similar approach has also been taken for the active travel elements of the study in the AMAT appraisal). In terms of economic benefits that have not been monetised as part of this appraisal: • Connectivity improvements could lead to more efficient labour markets, providing access to new or better jobs for people who could not previously access these jobs • Improvement may help catalyse and unlock development opportunities close to the corridor, as well as supporting existing employment and other economic generators (e.g TECA) located along the corridor • Better access to education and training leading to more skilled local labour markets		
Economy	ALL	**Active Travel:** • Greater number of trips made by active travel modes would have a positive impact on health creating business savings from reduced absenteeism • Modal shift from the car may result in deferred infrastructure provision (roads, junction upgrades etc.) with the associated cost saving • A high quality, segregated and attractive route may encourage and promote sustainable tourism - with links to TECA (including the P&J venue) • The AMAT analysis, detailed in Appendix F and summarised in the table below provides an indication of benefits related to active travel in terms of: congestion, infrastructure, accidents, local air quality, noise, greenhouse gases, reduced risk of premature death, absenteeism, journey ambience and indirect taxation.		

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision

Economy

Factor	Value (£000s)											
	1B	1C	1D	1E	2B	2C	2D	2E	3B	3C	3D	3E
Congestion benefit	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Infrastructure maintenance	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Accident	14.5	14.5	14.9	14.5	14.5	14.5	14.9	14.5	14.5	14.5	14.9	14.5
Local air quality	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Noise	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Greenhouse gases	5.9	5.9	6.1	5.9	5.9	5.9	6.1	5.9	5.9	5.9	6.1	5.9
Reduced risk of premature death	1,514	1,514	1,552	1,514	1,514	1,514	1,552	1,514	1,514	1,514	1,552	1,514
Absenteeism	184	184	189	184	184	184	189	184	184	184	189	184
Journey ambience	1,735	1,735	1,778	1,735	1,735	1,735	1,778	1,735	1,735	1,735	1,778	1,735
Indirect taxation	-6.6	-6.6	-6.8	-6.6	-6.6	-6.6	-6.8	-6.6	-6.6	-6.6	-6.8	-6.6
Government costs	14,152	14,152	15,039	14,691	16,805	18,119	17,038	18,459	20,624	21,158	20,969	21,158
Present Value of Benefits (PVB)	3,449	3,449	3,536	3,449	3,449	3,449	3,536	3,449	3,449	3,449	3,536	3,449
Present Value of Costs (PVC)	14,151	14,151	15,038	14,691	16,805	18,119	17,037	18,459	20,624	21,158	20,969	21,158
BCR	0.24	0.24	0.24	0.23	0.21	0.19	0.21	0.19	0.17	0.16	0.17	0.16

The results of the analysis (which considered the benefits against the cost of the active travel elements of the options only), shows:

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
		○ Active travel benefits under IL1 give rise to BCRs ranging from 0.24 to 0.23 (depending on the variant) ○ Active travel benefits under IL2 give rise to BCRs ranging from 0.19 to 0.21 (depending on the variant) ○ Active travel benefits under IL3 give rise to BCRs ranging from 0.16 to 0.17 (depending on the variant) ○ BCRs are highest for the IL1 variants, given that there are additional costs associated with delivering active travel infrastructure alongside higher levels of bus priority infrastructure (given the more complex junction design required), but no additional active travel benefits ○ All D variants yield slightly higher benefits than the B, C and E variants, given that the D variants include an additional stretch of infrastructure on the BCIP scheme linking to the A944 and hence offer improved active travel access to a larger area • A more direct active travel route would generate journey time benefits for existing cyclists. The analysis presented in Appendix F.3 highlights monetised benefits of approximately **£30k** in terms of journey time savings through the implementation of more direct cycling infrastructure. This saving is generated predominantly by those cyclists for whom there is, at present, no direct cycling route i.e., between communities along the A96 from Kintore to Craibstone. Although large-scale infrastructure schemes for other modes typically assume a 60-year appraisal period, this is generally not recommended for active mode interventions as they are more likely to have more finite project lifespans and increased uncertainty around the longevity of their impacts. Therefore, in line with most appraisals of cycling and walking infrastructure schemes, the above has assumed an appraisal period of 20 years.		
		✓✓		
Economy	ALL	An overview of the overall outcome of the Travel Economic Efficiency (TEE) economic analysis across all variants and intervention level is presented here, before the results for each variant are discussed individually in the rows which follow. The total (general traffic and public transport) economic impacts derived from TUBA, the present value of the costs of each option, and the resulting benefit to cost ratio for each variant under each of the three intervention levels is shown in the table below. Note that detail on option costs is provided in the *Affordability* criteria appraisal below with Appendix H providing greater detail. The table shows, as anticipated, negative BCR figures across all options. IL2 (the enhanced bus lanes) with variant D produces the lowest BCR of -6. All variants under IL1 (the standard bus lanes) produce the least negative BCR values, reflecting the reduced impact of this intervention on general traffic compared to IL2 and IL3. Subsequent sections show these figures split out by road and public transport for each route variant.		

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td rowspan="2">Economy</td><td></td><td colspan="3">
<table>
<tr><th></th><th></th><th colspan="3">General Traffic and Public Transport</th></tr>
<tr><th>Intervention Level</th><th>Variant</th><th>Total Benefit (£m)</th><th>Present Value of Costs (PVC) (£m)</th><th>Benefit to Cost Ratio (BCR)</th></tr>
<tr><td rowspan="4">1</td><td>B</td><td>-£21.3</td><td>£20.7</td><td>-1.0</td></tr>
<tr><td>C</td><td>-£10.7</td><td>£32.6</td><td>-0.3</td></tr>
<tr><td>D</td><td>-£29.3</td><td>£23.4</td><td>-1.3</td></tr>
<tr><td>E</td><td>-£11.9</td><td>£36.1</td><td>-0.3</td></tr>
<tr><td rowspan="4">2</td><td>B</td><td>-£139.3</td><td>£37.3</td><td>-3.7</td></tr>
<tr><td>C</td><td>-£127.2</td><td>£56.6</td><td>-2.2</td></tr>
<tr><td>D</td><td>-£225.3</td><td>£37.6</td><td>-6.0</td></tr>
<tr><td>E</td><td>-£129.7</td><td>£60.1</td><td>-2.2</td></tr>
<tr><td rowspan="4">3</td><td>B</td><td>-£165.4</td><td>£71.3</td><td>-2.3</td></tr>
<tr><td>C</td><td>-£161.6</td><td>£94.8</td><td>-1.7</td></tr>
<tr><td>D</td><td>-£279.9</td><td>£79.7</td><td>-3.5</td></tr>
<tr><td>E</td><td>-£160.0</td><td>£94.6</td><td>-1.7</td></tr>
</table>
</td><td colspan="2"></td></tr>
<tr><td>B

(Road and Bus TEE)</td><td colspan="3">The travel time efficiency analysis, as presented in full in Appendix F shows:

Road Benefits
• As expected, given the significant reallocation of road space to bus and active travel, there are significant road disbenefits overall across all intervention levels as shown in the table below
• Given the increased traffic re-routeing and longer car journey times, forming part of the overall disbenefit, there is an increase in fuel costs and in associated green-house gas emissions
• Variant B shows the smallest disbenefits across the intervention levels (although under IL1, variants B, C and E are similar).</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td>Economy</td><td></td><td colspan="3">
<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Time benefit</th><th>Fuel VOC benefit</th><th>Non-fuel VOC benefit</th><th>Change in indirect tax revenue</th><th>Road GHG</th><th>Total Benefit Road</th></tr>
<tr><td>1</td><td rowspan="3">B</td><td>-£41.4</td><td>-£2.6</td><td>-£1.0</td><td>£0.6</td><td>-£0.7</td><td>-£44.9</td></tr>
<tr><td>2</td><td>-£189.0</td><td>-£15.1</td><td>-£7.8</td><td>£4.4</td><td>-£4.7</td><td>-£212.3</td></tr>
<tr><td>3</td><td>-£216.7</td><td>-£17.0</td><td>-£8.3</td><td>£4.7</td><td>-£5.1</td><td>-£242.5</td></tr>
</table>
Public Transport Benefits and Public Transport Benefit to Cost Ratio
• As expected, given the significant reallocation of road space to public transport, there are significant public transport benefits overall across all intervention levels as shown in the table below
• The public transport benefits generated cannot negate the disbenefits to general traffic as noted in the table above, although it is again noted that the outcome of the modelling results and subsequent economic impacts presented in this chapter are likely to represent a worst-case scenario in terms of journey times and economic impacts (in reality a greater number of car trips would convert to public transport) so the disbenefits to general road traffic are likely to be less and the benefits to public transport are likely to be more
• Variant B shows the smallest public transport benefits across the intervention levels
• When the public transport benefits are considered against the cost of the bus priority measures (i.e., not including the road disbenefits and not including the costs associated with the provision of the active travel infrastructure), the purely public transport BCR figures generated are all over 1 indicating value for money in a purely public transport context. Given the lower cost of variant B, it generates some of the highest BCR ratios over all intervention levels, compared to other variants
<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Public Transport Total Benefit</th><th>Present Value of Costs (PVC)</th><th>Public Transport Benefit to Cost Ratio (BCR)</th></tr>
<tr><td>1</td><td rowspan="3">B</td><td>£23.6</td><td>£20.7</td><td>1.1</td></tr>
<tr><td>2</td><td>£73.0</td><td>£37.3</td><td>2.0</td></tr>
<tr><td>3</td><td>£77.1</td><td>£71.3</td><td>1.1</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td rowspan="3">Economy</td><td></td><td colspan="3">Combined Road and Public Transport Benefit to Cost Ratios

The results of the combined road and public transport economic analysis (as presented in the all option results table at the start of this section) in terms of an overall BCR for each scheme show that once the road ‘benefits’ are also included in the BCR figure, as expected, the overall BCR figures for the variant across all intervention levels are negative, indicating overall disbenefits. The BCR figures for intervention levels 2 and 3 highlight that the significant additional cost to implement the busway (intervention level 3) generates a more negative BCR figure as the journey time improvements seen under intervention level 3 are not of a sufficiently greater magnitude than under level 2.</td></tr>
<tr><td></td><td>General traffic: ✗
Public Transport: ✓</td><td>General traffic: ✗✗
Public Transport: ✓✓</td><td>General traffic: ✗✗
Public Transport: ✓✓</td></tr>
<tr><td>C

(Road and Bus TEE)</td><td colspan="3">The travel time efficiency analysis, as presented in summary below and in full in Appendix F shows:

Road Benefits
• As expected, given the significant reallocation of road space to public transport, significant road disbenefits overall across all intervention levels occur as shown in the table below
• Given the increased traffic re-routeing and longer car journey times, forming part of the overall disbenefit, there is an increase in fuel costs and in associated green-house gas emissions
• Variant C shows similar disbenefits across the intervention levels to variant E and generally greater disbenefits than variant B, but smaller disbenefits than variant D (although, as noted above, under IL1, variants B, C and E are similar)

<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Time benefit</th><th>Fuel VOC benefit</th><th>Non-fuel VOC benefit</th><th>Change in indirect tax revenue</th><th>Road GHG</th><th>Total Benefit Road</th></tr>
<tr><td>1</td><td rowspan="3">C</td><td>-£40.3</td><td>-£2.4</td><td>-£0.7</td><td>£0.5</td><td>-£0.6</td><td>-£43.4</td></tr>
<tr><td>2</td><td>-£196.3</td><td>-£15.6</td><td>-£8.2</td><td>£4.6</td><td>-£5.0</td><td>-£220.4</td></tr>
<tr><td>3</td><td>-£230.5</td><td>-£17.7</td><td>-£8.8</td><td>£5.0</td><td>-£5.5</td><td>-£257.5</td></tr>
</table>

Public Transport Benefits and Public Transport Benefit to Cost Ratio

• Similar to variant B, although with a greater magnitude of benefits, significant public transport benefits overall across all intervention levels (as shown in the table below), but these benefits cannot negate the disbenefits to general traffic
• Variant C shows the greatest public transport benefits across the intervention levels, compared to other variants</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td rowspan="2">Economy</td><td></td><td colspan="3">
When the public transport benefits are considered against the cost of the bus priority measures (i.e., not including the road disbenefits and not including the costs associated with the provision of the active travel infrastructure), the purely public transport BCR figures generated are all either 1 or greater indicating value for money in a purely public transport context. Given the higher cost of variant C compared to variant B, the BCR values are lower, indicating the increased cost of the scheme compared to variant B is not offset by journey time improvements
<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Total Benefit Public Transport</th><th>Present Value of Costs (PVC)</th><th>Benefit to Cost Ratio (BCR)</th></tr>
<tr><td>1</td><td rowspan="3">C</td><td>£32.7</td><td>£32.6</td><td>1.0</td></tr>
<tr><td>2</td><td>£93.2</td><td>£56.6</td><td>1.6</td></tr>
<tr><td>3</td><td>£95.8</td><td>£94.8</td><td>1.0</td></tr>
</table>
Combined Road and Public Transport Benefit to Cost Ratios

The results of the combined road and public transport economic analysis (as presented in the all option results table at the start of this section), in terms of an overall BCR for each option show that once the road ‘benefits’ are included in the BCR figure, as expected, the overall BCR figures for the variant across all intervention levels are negative, indicating overall disbenefits. The BCR figures for intervention level 2 and 3 highlight that the significant additional cost to implement the busway (intervention level 3) generates a more negative BCR figure as the journey time improvements seen under intervention level 3 are not of a sufficiently greater magnitude than under level 2.
</td></tr>
<tr><td></td><td>General traffic: ×
Public Transport: ✓</td><td>General traffic: ××
Public Transport: ✓✓✓</td><td>General traffic: ××
Public Transport: ✓✓✓</td></tr>
<tr><td></td><td>D

(BCIP)

(Road and Bus TEE)</td><td colspan="3">The travel time efficiency analysis, as presented in summary below and in full in Appendix F shows:

Road Benefits
As expected, given the significant reallocation of road space to public transport, significant road disbenefits occur across all intervention levels as shown in the table below.
Given the increased traffic re-routeing and longer car journey times, forming part of the overall disbenefit, there is an increase in fuel costs and in associated green-house gas emissions. The figures under variant D for this disbenefit are greater than under the other variants, reflecting the greater level of re-routing of general traffic. This is as expected given the reallocation of road space along the full length of the BCIP scheme and towards Union Square.</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td>Economy</td><td></td><td colspan="3">
Variant D shows the greatest overall disbenefits across the intervention levels.
<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Time benefit</th><th>Fuel VOC benefit</th><th>Non-fuel VOC benefit</th><th>Change in indirect tax revenue</th><th>Road GHG</th><th>Total Benefit Road</th></tr>
<tr><td>1</td><td rowspan="3">D</td><td>-£51.9</td><td>-£2.7</td><td>-£0.9</td><td>£0.7</td><td>-£0.8</td><td>-£55.6</td></tr>
<tr><td>2</td><td>-£277.4</td><td>-£20.3</td><td>-£11.7</td><td>£7.1</td><td>-£7.5</td><td>-£309.7</td></tr>
<tr><td>3</td><td>-£332.7</td><td>-£23.7</td><td>-£13.2</td><td>£8.2</td><td>-£8.7</td><td>-£370.2</td></tr>
</table>
Public Transport Benefits and Public Transport Benefit to Cost Ratio

As expected, given the significant reallocation of road space to public transport, significant public transport benefits occur across all intervention levels as shown in the table below, however, while variant D produces the greatest disbenefits to general traffic (as shown in the table above), it does not yield the greatest benefits to public transport.
The public transport benefits generated cannot negate the disbenefits to general traffic as noted in the table above, although it is again likely these economic impacts represent a worst-case scenario.
When the public transport benefits are considered against the cost of the bus priority measures (i.e., not including the road disbenefits and not including the costs associated with the provision of the active travel infrastructure), the purely public transport BCR figures generated are all over 1 indicating value for money in a purely public transport context (with Option 2D yielding the greatest public transport BCR figure of 2.2, the highest BCR value across all options).

<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Total Benefit Public Transport</th><th>Present Value of Costs (PVC)</th><th>Benefit to Cost Ratio (BCR)</th></tr>
<tr><td>1</td><td rowspan="3">D</td><td>£26.3</td><td>£23.4</td><td>1.1</td></tr>
<tr><td>2</td><td>£84.4</td><td>£37.6</td><td>2.2</td></tr>
<tr><td>3</td><td>£90.3</td><td>£79.7</td><td>1.1</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td rowspan="2">Economy</td><td></td><td colspan="3">Combined Road and Public Transport Benefit to Cost Ratios

The results of the combined road and public transport economic analysis (as presented in the all option results table at the start of this section), in terms of an overall (road and public transport) BCR for each scheme shows that once the road ‘benefits’ are included in the public transport BCR figure, the overall BCR for the variant across all intervention levels are negative, indicating overall disbenefits.

General traffic: ✗ Public Transport: ✓✓ | General traffic: ✗✗✗ Public Transport: ✓✓ | General traffic: ✗✗✗ Public Transport: ✓✓✓</td></tr>
<tr><td>E

(Great Northern Road and railway bridge widening

(Road and Bus TEE)</td><td colspan="3">The travel time efficiency analysis, as presented in summary below and in full in Appendix F shows:

Road Benefits
• As expected, given the significant reallocation of road space to public transport, significant road disbenefits occur across all intervention levels as shown in the table below.
• Given the increased traffic re-routeing and longer car journey times, forming part of the overall disbenefit, there is an increase in fuel costs and in associated green-house gas emissions.
• Variant E shows similar disbenefits across the intervention levels to variant C and generally greater disbenefits than variant B, but smaller disbenefit than variant D (although, as noted above, under intervention level 1, variants B, C and E are similar).

<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Time benefit</th><th>Fuel VOC benefit</th><th>Non-fuel VOC benefit</th><th>Change in indirect tax revenue</th><th>Road GHG</th><th>Total Benefit Road</th></tr>
<tr><td>1</td><td rowspan="3">E</td><td>-£38.9</td><td>-£2.4</td><td>-£0.7</td><td>£0.5</td><td>-£0.6</td><td>-£42.1</td></tr>
<tr><td>2</td><td>-£192.5</td><td>-£15.3</td><td>-£8.0</td><td>£4.5</td><td>-£4.8</td><td>-£216.2</td></tr>
<tr><td>3</td><td>-£228.9</td><td>-£17.7</td><td>-£8.7</td><td>£5.0</td><td>-£5.5</td><td>-£255.8</td></tr>
</table>
Public Transport Benefits and Public Transport Benefit to Cost Ratio

• Similar to variant B, although with a greater magnitude of benefits, significant public transport benefits occur across all intervention levels (as shown in the table below), but these benefits cannot negate the disbenefits to general traffic
• Variant E shows the public transport benefits across the intervention levels marginally lower than variant C (which has the greatest benefits)</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td rowspan="2">Economy</td><td rowspan="2"></td><td colspan="3">
When the public transport benefits are considered against the cost of the bus priority measures (i.e., not including the road disbenefits and not including the costs associated with the provision of the active travel infrastructure), the purely public transport BCR figures generated are all either 1 or greater indicating value for money in a purely public transport context. Given the higher cost of variant C compared to variant B, the BCR values are lower, indicating the increased cost of the scheme compared to variant B is not offset by similar journey time improvements.
<table>
<tr><th>Intervention Level</th><th>Variant</th><th>Total Benefit Public Transport</th><th>Present Value of Costs (PVC)</th><th>Benefit to Cost Ratio (BCR)</th></tr>
<tr><td>1</td><td rowspan="3">E</td><td>£30.1</td><td>£36.1</td><td>0.8</td></tr>
<tr><td>2</td><td>£86.5</td><td>£60.1</td><td>1.4</td></tr>
<tr><td>3</td><td>£95.7</td><td>£94.6</td><td>1.0</td></tr>
</table>
Combined Road and Public Transport Benefit to Cost Ratios

The results of the combined road and public transport economic analysis (as presented in the all option results table at the start of this section), in terms of an overall BCR for each scheme show that once the road ‘benefits’ are also included in the BCR figure, as expected, the overall BCR figures for the variant across all intervention levels are negative, indicating overall disbenefits. The BCR figures for intervention level 2 and 3 highlight that the significant additional cost to implement the busway (intervention level 3) generates a more negative lower BCR figure as the journey time improvements seen under intervention level 3 are not of a sufficiently greater magnitude than under level 2.
</td></tr>
<tr><td>General traffic: ×
Public Transport: ✓</td><td>General traffic: ××
Public Transport: ✓✓</td><td>General traffic: ××
Public Transport: ✓✓✓</td></tr>
<tr><td></td><td>ALL</td><td colspan="3">Transport Integration:
While faster bus journey times along the corridor could enable easier integration with the rail network (through enabling ease of sustainable access to the city centre and bus and rail stations for onward travel) it is noted that there is potential for passenger demand abstraction from the rail network along the corridor, particularly from Inverurie and Kintore.
Land-Use Integration:</td></tr>
</table>

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Integration		• The proposed active travel route facilitates access to the Craibstone Park & Ride site and links into other shared-use paths connecting to Dyce railway station, and therefore has the ability to integrate well with other modes of transport. The proposed segregated cycle track between Craibstone Park & Ride and the city centre would also encourage people to drive to P&R sites and cycle to their final destination. • Both the proposed cycle track and the bus priority measures on the corridor would route close to and support planned new development (as part of the region's strategic growth areas) along the corridor. Within Aberdeen, this would include sites at Woodside, Davidsons Papermill (Muggiemoss Road), Craibstone South, North and Walton Farm, Dyce Drive, and Rowett North and South. In Aberdeenshire this would include development locations proposed to the east of Blackburn (housing), to the south of Kintore (both employment, housing, and mixed-use sites) as well as housing sites to the north and south of Inverurie and employment land to the south of Inverurie. Across these sites, a total of approximately 4,700 houses in Aberdeen (with a further 7,000 if Grandholm were to be included) and over 3000 houses and 45ha employment land in Aberdeenshire. **Policy Integration:** • All options support the National Transport Strategy 2 (NTS2) Sustainable Travel Hierarchy through prioritising active travel first, public transport as the secondary mode and the car thereafter, with a significant reduction in carriageway capacity for the car under every option, to varying degrees. • Sustainable travel options integrate well with the Scottish Government's Climate Change Bill and regional policy on providing for modal shift to greener more sustainable modes. Scottish Government published an *Update to the Climate Change Plan 2018 – 2032: Securing a Green Recovery on a Path to Net Zero* in December 2020. The plan includes an ambitious commitment to reduce car kilometres by 20% by 2030. All the options proposed support working towards that target. • Any shift towards trips being made by sustainable modes will help work towards a 50:50 mode split target (as aspired to in RTS:2040). As noted previously, modal shift is anticipated to be higher under IL2 and IL3 where a greater level of bus priority is provided. • All options support the Aberdeen City Centre Masterplan and Sustainable Urban Mobility Plan which aim to increase provision for sustainable travel • The Roads Hierarchy provides policy context for future transport planning in the City, ensuring traffic is directed onto the most appropriate route. There is an expectation that benefits of the AWPR must be 'locked in' to prioritise the movement of active and sustainable travel through the re-allocation of carriageway space, junction capacity and other traffic management/prioritisation measures. The options proposed all clearly help in the 'locking in' of benefits and the prioritisation of active and sustainable travel along the A96 corridor (also noted in the Nestrans Active Travel Strategy). • The Community Planning Aberdeen Board approved a refreshed *Local Outcome Improvement Plan (LOIP) 2016-26* on 7 July 2021. The focus on the refreshed LOIP is on economic, health and social recovery and focussed on partnership working. Economic and environmental success which ensures equality across Aberdeen is key. The options proposed here all seek to ensure equality of access by providing the infrastructure and services to enable this.		
Integration				

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Integration				The segregated two-way cycle track would be easier to integrate into a busway design. It would be more difficult to provide the segregated one-way with flow cycle tracks with the busway level of intervention as this would require additional junction complexity and likely cause confusion due to the number of different directional 'carriageway' lanes across all modes i.e., creating a cross-section with one-way cycle track, two-way road, one-way cycle track, 2-way busway. Under IL3, bespoke bus vehicles may be required to operate on the busway depending on the form and infrastructure of the busway. This may cause an issue with integrating the busway with the existing network and bus fleet.
	B & C	Both variants B and C use the BCIP between Kittybrewster and Clifton Road with a general traffic lane converted to a bus lane / busway. The BCIP scheme is still progressing through the planning process and changes to the scheme would need to be justified at this stage given the business case for the scheme was based on the implementation of a dual carriageway between Skene Square and Kittybrewster providing continuous dual carriageway provision from South College Street to Craibstone (if the, as yet, uncommitted section of the BCIP scheme from Kittybrewster to Don Street were to go ahead – and the options suggested here were not implemented).		
		✓✓	✓✓	✓
	D	Variant D utilises the entire length of the committed Berryden Corridor scheme, reducing the committed dual carriageway to a single lane for general traffic with one of the general traffic lanes converted to a bus lane / busway. As noted above for variants B and C, the Berryden Corridor scheme is still working through the planning process and changes to the scheme would need to be highly justified at this stage given the intention of this option to change the scheme throughout its length.		
		✓✓	✓✓	✓
	E	Unlike route variants B, C and D, Option E does not remove capacity form the Berryden Corridor scheme and as such better integrates with the scheme – although noting that some change at the A96 / Clifton Road junction is required to accommodate the required bus gate to enable access to the existing Great Northern Road.		
		✓✓✓	✓✓✓	✓✓

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Accessibility & Social Inclusion	ALL	**Active Travel:** • **Community Accessibility**: o access to local services by walking and cycling would improve, as this is designed into the strategic network. This would be true in both the urban and more rural community environments. o there would be improved active travel linkages to a number of key trip attractors along the route including the retail park at Kittybrewster, centres of employment at Dyce, and Kirkhill industrial estate and Aberdeen city centre itself, and improved access to the business and entertainment complex at TECA o the provision of segregated cycle facilities is also likely to provide improved safe routes to schools, particularly for Kittybrewster Primary school located directly on the route of the proposed active travel track (on the section between Kittybrewster roundabout and Clifton Road where the proposed track routes off the BCIP). Woodside School is also located close to the corridor and the active travel proposals, including improved junction crossings on the A96 would provide improved access to the school. The track would also provide additional connectivity to St. Machar Academy located immediately East of the Kittybrewster roundabout. Improved and safer crossings for pedestrians (through reduced wait time at signals and the tightening up of junction geometries on side roads to reduce crossing lengths and slow down turning vehicles). • **Comparative Accessibility**: o higher quality, safer active travel routes and facilities would remove barriers which prevent some groups in society using active travel. Less likely to have a material impact on inequities associated with deprivation although cycling can provide a cost-effective alternative to the private car and may help reduce 'forced' car ownership if it becomes a realistic proposition for some who would not otherwise cycle due to safety concerns. **Bus Travel:** • **Community Accessibility**: o access to local services by bus would improve through reduced journey times. This would be true in both the urban and more rural community environment. o as noted above in relation to active travel, there would be improved public transport connectivity to a number of key trip attractors along the route including the retail park at Kittybrewster, centres of employment at Dyce, and Kirkhill industrial estate and Aberdeen city centre itself, and improved access to the business and entertainment complex at TECA o access by bus to St. Machar Academy would be improved for those living further from the school campus • **Comparative Accessibility**: o there would be increased mode choice for those without access to a private car but who would like to travel more sustainably and provide increased access to public services and opportunities for those without access to a car and may help reduce 'forced' car ownership o reduced journey times by bus and improved infrastructure (i.e., appropriate bus shelters, accessible boarding and alighting etc.) would remove barriers which prevent some groups in society using the bus.		

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Accessibility & Social Inclusion	B	'Hansen' connectivity analysis has been undertaken to provide an indication of the anticipated accessibility change (by bus) from the Do Minimum in terms of access to employment with the options in place (Appendix G presents the full analysis). While all variants show an increase in public transport accessibility variant B has the *lowest* increase in employment accessibility under all intervention levels, showing (in the 2037 modelled year): • a 1.9% (AM) and a 1.8% (PM) increase under IL1 • a 3.2% (AM and PM) increase under IL2 • a 3.4% (AM) and a 3.1% (PM) increase under IL3		
		✓	✓✓	✓✓
	C	In terms of the Hansen analysis undertaken, variant C has some of the greatest increases in employment accessibility under all intervention levels, showing (in the 2037 modelled year): • a 2.4% (AM) and a 2.3% (PM) increase under IL1 • a 4.4% (AM) and a 4.1% (PM) increase under IL2 • a 4.2% (AM) and a 4.1% (PM) increase under IL3		
		✓✓	✓✓✓	✓✓✓
	D	Variant D differs from the other variants in the route adopted for the bus priority measures south of the A96 / Clifton Road junction, where the BCIP is used to provide bus priority measures into the city centre at Union Square. For those bus services re-routed to use this new route, there would be an increase in public transport accessibility to the bus and rail stations and the surrounding area, including Union Street. However, there would be reduced accessibility to the areas on and around Powis Terrace / Powis Place and George Street to the north of the centre of Aberdeen. The accessibility benefit may be most for bus users on longer distance services who are wishing to access onward connections via bus or rail at Union Square and would be very much dependent on bus operator decision as to which services to re-route. In terms of the Hansen analysis undertaken, variant D has some of the greatest increases in employment accessibility under all intervention levels in the AM period, but with lower increases in the PM period, showing (in the 2037 modelled year): • a 1.9% (AM) and a 1.3% (PM) increase under IL1 • a 4.1% (AM) and a 2.6% (PM) increase under IL2 • a 4.2% (AM) and a 2.3% (PM) increase under IL3		
		✓	✓✓	✓✓
	E	In terms of the Hansen analysis undertaken, variant E has some of the greatest increases in employment accessibility under all intervention levels, showing (in the 2037 modelled year):		

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
		• a 2.3% (AM) and a 2.1% (PM) increase under IL1 • a 4.0% (AM) and a 3.7% (PM) increase under IL2 • a 4.6% (AM) and a 3.9% (PM) increase under IL3		
		✓✓	✓✓✓	✓✓✓
Feasibility	ALL	All options include the widening of the single carriageway section of the A96 between Printfield Walk / Tanfield Walk and Kittybrewster roundabout to enable bus lanes / busways through this section (noting that if this were not possible – for the reasons given below – then traffic 'gating' could be used to give priority to buses through this narrower section of the corridor). Widening this section of road: • would involve the widening of the road into residential front gardens on the northern side of the carriageway. This would require Compulsory Purchase Orders • once implemented, would mean the proximity of properties to the carriageway is likely to create increased environmental / health impacts to those residents. • on the southern side of the road would require relocation of the existing communal bin provision (there is some space for this closer to Kittybrewster roundabout, but it would require residents of the terraced flats on the southern side of the road walking further to access the bins). • would impact on the existing on-street parking on the southern side of the carriageway that would need to be removed which would additionally impact on residents in the area. To allow for the proposed route variants B, C, D or E to be implemented, there will need to be a relocation of further on-street car parking spaces and communal bins, and potentially third-party land requirements, as set out in Appendix I . The Aberdeen Rapid Transit (ART) – Options Appraisal study is ongoing with the A96 corridor identified as an 'ART' corridor. The options coming forward from this study will need to align and be feasible in light of the outcomes of that study in terms of the type of infrastructure and the vehicles which will operate on it.		
		Along the corridor, there is likely to be a need to revise waiting and loading restrictions to enable the bus lanes to operate successfully		
		Limited requirement to alter junctions as bus lanes would stop prior to junction stop lines.	Junctions will need to be redesigned to accommodate a new method of signal control to give buses the required level of priority.	Junctions would need to be re-engineered to accommodate the busway. This would require the signalisation of small / medium sized roundabouts (i.e., Kittybrewster) and the part signalisation of larger roundabouts. No change is proposed to the Mounthooly roundabout although a new traffic signal-

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Feasibility				controlled junction would be required to support bus movements to / from the busway to Gallowgate via the roundabout.
		Bus lanes are more adaptable than busways with the ability to alter the operational times (allowing inter-peak and loading and off-peak parking) and allow vehicles other than buses to use the lane ((e.g., HGVs, taxis motorcycles) . Bus lanes are also far easily to remove or adapt at a later date if required, depending on scheme performance and impacts.	Only authorised vehicles would be allowed to operate on the busway, meaning it would be less adaptable. The 'closed' busway system would more easily allow for future use by autonomous buses. This could narrow the space required for the busway carriageway. The busway would offer the future opportunity to convert the busway to tramway – but the highway works cost to revert back would be substantial. There would likely be substantial utility diversions and protection works required in order to implement the busway.	
	B	A new junction configuration is required at the Berryden Corridor junction with Clifford Road and Powis Terrace. Complex signalling would be required due to the competing priorities. This is likely to require a junction redesign with potential implications on third party land.		
		✓	✓	✓
	C	As above for variant B, but additionally there would be significant assessment required to establish the feasibility of a wider bridge over the railway line between Leslie Terrace and Belmont Road. This would require a new retaining wall alongside the railway south of the bridge and consideration of the availability of third-party land. Discussion with Network Rail would be required to help establish the feasibility. Significant changes also likely required to Belmont Road, Leslie Terrace and Bedford Road junctions with the A96 as a result.		
		×	×	×
	D	The variant requires bus lane / busway implementation over the full length of the Berryden Corridor including on Berryden Road, Caroline Place and Skene Square and along existing dual carriageway sections including Gilcomston Steps/ Woolmanhill and Denburn Road. Given the Berryden Corridor scheme is still progressing within the planning process and the case for the scheme's implementation has been based on the outcomes it can deliver, it may be very difficult to alter the scheme at this stage in the process and also convey this to the public. A rerouting of bus services along the BCIP would require a fundamental review of all bus routes entering the city centre from the north to establish most suitable and appropriate routes. This review may allow the city centre to be served more efficiently by bus with better connections to key destinations, including the railway and bus stations (furthermore it may allow streets within the city centre to prioritise active modes e.g., George Street). Discussion with the bus operators highlighted that the Powis Terrace, George Street, Gallowgate / Broad Street area generates significant passengers and careful thought would be needed to establish which (if any) bus services could be rerouted to use the BCIP and the viability of this. A 'critical mass' of buses using the BCIP as a route into the city centre would be required to justify the proposed intervention. As an alternative to the full use of the Berryden Corridor and onto the bus and railway stations via Denburn Road:		

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
Feasibility		• Bus services could route via the BCIP to Hutcheon Street and on to Mounthooly roundabout and then continue to serve George Street or Gallowgate / Broad Street. However, Hutcheon Street is a single carriageway road that includes on-street parking and offers little scope for bus priority measures along its length with bus services at increased risk of delay due to congestion. • Bus services could be rerouted to access Union Street via Denburn Road, Carmelite Street, Guild Street and Market Street. While this provides a good connection to the rail and bus stations it is unlikely to be suitable for all services, and perhaps more appropriate for longer distance services where passengers are connecting onwards to other bus services or to the rail network (and this may not encompass sufficient services to justify the intervention)		
		××	××	××
	E	As above for variant C, there would be significant assessment required to establish the feasibility of a wider bridge over the railway line between Leslie Terrace and Belmont Road. The possibilities for the junction layout at the intersection of the BCIP with Clifford Road and Powis Terrace requires additional land and the possible closure of the Clifford Road arm. Design work would be required to understand the most efficient way to balance road user requirements (including pedestrians and cyclists) at this key junction where the proposed active travel and bus priority measures would 're-join' the A96 carriageway (after using Great Northern Road) no longer part of the A96 once the Berryden corridor is in place).		
		×	×	×
Affordability	ALL	Individual variant costs are discussed below, with these initial points relating to all variants: • The COVID-19 pandemic has placed a severe financial burden on bus operators with the potential for long lasting damage. The earlier 'work from home' Government mandate alongside health warnings to avoid using public transport, saw passenger numbers fall dramatically at the start of the pandemic and only recover to around 75% of pre-pandemic figures (for concessionary fares revenue as reported by Transport Scotland) • In order to support a 'green recovery' from the pandemic, sustainable transport solutions need to be considered which can positively contribute towards the Climate Change agenda. This is likely to be influenced by changes in travel patterns borne out of increased home working including changes in peak hour travel and in the frequency of travel. Effective monitoring of travel behaviours and trends as the region emerges fully from the pandemic will be important to ensuring the longer- term financial viability of services. All options provide significantly increased bus priority ensuring reduced bus journey times and increased service reliability, and as such should attract new users to the services, helping secure their financial viability with sufficient demand to meet operating costs • All options include an intervention at Port Elphinstone with the introduction of a dedicated left turn lane between Elphinstone Road and the eastbound carriageway of the A96 at the Port Elphinstone roundabout. With the A96 forming part of the trunk road network its operation and maintenance is the responsibility of Transport Scotland – with a review of proposals for the A96 dualling scheme currently underway. As such, there is the possibility that any intervention may be altered at a future date should Transport Scotland define other priorities for the Port Elphinstone roundabout. This may lead to unwarranted spend.		

<table>
<tr><th>Criteria</th><th>Route Variant</th><th>Intervention Level 1:
Standard Bus Lanes and active travel route provision</th><th>Intervention Level 2:
Enhanced Bus Lanes and active travel route provision</th><th>Intervention Level 3:
Busway and active travel route provision</th></tr>
<tr><td rowspan="3">Affordability</td><td rowspan="2"></td><td colspan="3">All options would increase maintenance costs along the corridor due to new / altered signals at junctions (including at cycle and pedestrian crossings) often with more complex signal arrangements.
There may be an opportunity to reduce the cost of the options to the public purse through bus operator contributions given the scale of the benefits to bus operations that may be achieved. This would likely need to be agreed through a Bus Services Improvement Partnership.
New segregated active travel infrastructure would create additional maintenance costs due to the need to de-ice / grit and manage vegetation alongside the cycle tracks as well as keep free of litter e.g., broken glass. This cost would be lower for the two-way segregated track given the ability to undertake maintenance over both directions of the track at the same time.</td></tr>
<tr><td></td><td></td><td>Specific vehicles may be required to operate on the busway. This would require additional up front capital cost on vehicles as well as potential additional depot requirements and additional maintenance costs.
The implementation of the busway would require some roundabouts to be converted to signalised junctions, increasing road maintenance costs over and above IL1 and IL2.</td></tr>
<tr><td>B, C, D & E: Capital Costs</td><td colspan="3">In terms of the capital costs of the proposed bus active travel infrastructure (Appendix H presents this in detail) it should be noted that:
The proposed bus priority measures under the different variants all propose reallocating existing road space to provide the bus lanes / busway proposals. Therefore, the bus elements of the options do not require additional road widening the full length of the priority routes to accommodate this (noting there is specific road widening required at the Belmont Road bridge in variants C and E). The active travel proposals on the other hand are predominately delivered within existing footway areas but there is not always the space to deliver the widths of cycle tracks and footways between the road carriageway and the back of the footway. At various locations, additional highway or third party land will be required to accommodate the proposals.
The proposals, covering both active travel and bus measures, require amended signal timings at many of the junctions to accommodate both the bus and active travel elements. In such cases, the cost for this has been split between the two modes with 75% of the costs attributed to the bus elements and 25% to the active travel elements.
All costs include 44% optimism bias, as appropriate at this stage in the STAG appraisal process
The costs do not account for:
Costs associated with land / property acquisition</td></tr>
</table>

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision

Affordability

- Statutory approvals / consents
- Adjustments to existing public utility apparatus
- Surveys and investigation
- Design and works supervision fees
- Value Added Tax (VAT) and Inflation, as the date of construction is yet to be established

In terms of the variant capital costs:

- All variants include the cost of road widening between Printfield Walk and Kittybrewster roundabout, although noting that traffic gating could be implemented here instead if the widening were not possible / to reduce overall scheme costs
- Variants C and E both include the widening (through replacement) of the railway bridge at Belmont Road, which comes with significant additional costs

Given the BCIP scheme is committed but work is yet to commence on the ground, it is assumed that if variant D was to progress, then the update design could be incorporated in the scheme now, and therefore not require any alteration to the road once it was built. The costs associated with this variant over the section south of Clifton Road have been reduced to reflect the fact that some of the costs for scheme implementation will be borne by the BCIP.

The capital costs are set out for each intervention level and variant below. Note that the active travel costs presented are those for the two-way segregated cycle track. The costs against pedestrians are the improvements noted against TPO1 in terms of tightened junction geometries, tabletop treatments etc.

		Cost (£m)				Cost (£m) With 44% OB			
Intervention Level	**Variant**	**B**	**C**	**D**	**E**	**B**	**C**	**D**	**E**
1. Standard Bus Lane	**Total**	**47.2**	**64.5**	**52.3**	**70.2**	**67.9**	**92.9**	**75.3**	**101.1**
	Bus	*29.9*	*47.2*	*33.9*	*52.3*	*43.1*	*68.0*	*48.8*	*75.3*
	Cycle	*15.5*	*15.5*	*16.5*	*16.2*	*22.3*	*22.3*	*23.8*	*23.3*
	Ped	*1.8*	*1.8*	*1.9*	*1.8*	*2.6*	*2.6*	*2.7*	*2.6*
2. Enhanced Bus Lane	**Total**	**74.7**	**104.2**	**75.4**	**109.7**	**107.5**	**150.1**	**108.6**	**157.9**
	Bus	*54.0*	*81.9*	*54.5*	*86.9*	*77.8*	*117.9*	*78.4*	*125.2*
	Cycle	*18.2*	*19.9*	*18.7*	*20.4*	*26.2*	*28.7*	*26.9*	*29.3*
	Ped	*2.4*	*2.4*	*2.3*	*2.4*	*3.5*	*3.5*	*3.3*	*3.5*
3. Bus-Way	**Total**	**128.7**	**163.4**	**141.3**	**163.2**	**185.3**	**235.3**	**203.5**	**235.0**
	Bus	*103.2*	*137.2*	*115.4*	*137.0*	*148.6*	*197.6*	*166.1*	*197.2*
	Cycle	*23.5*	*24.1*	*23.9*	*24.1*	*33.8*	*34.7*	*34.4*	*34.7*
	Ped	*2.1*	*2.1*	*2.1*	*2.1*	*3.0*	*3.1*	*3.0*	*3.1*

It can be seen from the table that:

- The costs relating to all variants under IL1 are lower than IL2, with IL2 costs lower than IL3 costs, with are considerably higher still
- Variant B is the lowest cost option under all intervention levels

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
		○ Variant C and E are the most expensive given the costs attributable to the bridge widening		
	B	**Low**	**Low**	**Medium**
	C	**Low**	**Medium**	**High**
	D	**Low**	**Low**	**Medium**
	E	**Low**	**Medium**	**High**
Public Acceptability	Active Travel	**Walking:** Improvements to the pedestrian environment were welcomed by respondents to the public survey (the results of which are presented in Appendix J). Comments received as part of the engagement exercise noted the need to segregate cyclists from pedestrians. The importance of recognising that all public transport trips include an element of active travel was noted. **Cycling:** Improvements in cycling provision were welcomed by stakeholders, with the potential for improved active travel access to employment on the corridor i.e., at the airport, being noted. The public engagement exercise, highlighted a very favourable response to segregated cycle infrastructure, with respondents noting they would be more likely to cycle if segregated infrastructure was available and also that a safe route would encourage them to cycle further. In terms of the cycling infrastructure proposed, 41% of respondents noted that they would prefer a two-way segregated cycle track implemented alongside the A96, with 28% stating that they would prefer one-way (with flow) segregated cycle tracks (18% gave no preference between the two proposed options). Some 46% of respondents noted that they would change their travel behaviour if their preferred option was implemented. It was clear from comments received through the engagement exercise that the safety of the cycling infrastructure, including at crossings was important. It is also worth noting that only 8% of survey respondents stated that 'no active travel measures are required'. Overall, there is likely to be high public acceptability of the cycle (and walking) proposals.		
		✓✓✓		
	ALL	**Bus:** As noted above, given the growing concern for the Climate Emergency, it is very likely that improvements to sustainable travel would be welcomed. However, all proposals re-allocate existing road-space away from general traffic and are likely to increase traffic congestion and therefore may generate more some public opposition. Any unintended traffic rerouting is likely to be met with opposition from local affected communities. The public engagement exercise outcomes in terms of the intervention levels and individual route variants are discussed in the relevant rows below, but overall, 60% of survey respondents stated a preference for some level of bus priority on the A96. It is worth noting that		

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
	B, C, D & E	of those who stated that '*no bus priority is required'* (30% of survey respondents), over 80% of these respondents noted they did **not** use the bus to travel along the A96 corridor and therefore as such are unlikely to benefit from the proposals. In terms of the route variants, 34% noted they did not have a preference between the route variants, but that they supported the concept of new bus priority measures. Some 26% of respondents noted they would change their travel behaviour if their preferred route variant were implemented, with a further 25% noting they may change their travel behaviour – indicating an appetite for change if the 'offer' is right. It was noted that a shift in travel from the car to bus could be achieved if bus times were equivalent to car travel times. To make the schemes more successful may require complementary measures to be implemented which may prevent or discourage people from behaving as they currently do i.e., Low Emission / Zero Emission Zone, Congestion Charging Zone and Parking Demand Management. Such schemes are likely to be met (at least initially) with some public opposition. All options include carriageway widening between Kittybrewster Roundabout and Don Street / Tanfield Walk (noting that if this were not possible then traffic 'gating' could be used to give priority to buses through this section). As noted in the Feasibility appraisal section above the dualling of this stretch of carriageway would likely require Compulsory Purchase Orders of gardens / properties on the northern side of the carriageway, the relocation of communal bins on the southern side of the carriageway, and the removal of on-street parking. It is highly likely these proposals would be met with opposition from those residing in the properties on both the north and south side of the carriageway.		
		19% of respondents to the public survey noted a preference for IL1 – the standard bus lanes.	20% of respondents to the public survey noted a preference for IL2 – the enhanced bus lanes (a similar level of support to IL1). The flexibility of the bus lane infrastructure (as opposed to busway) was noted as a benefit in the public engagement exercise. Other comments noted the greater negative impact on general traffic on the enhanced bus lanes, as opposed to the standard bus lanes. One bus operator highlighted that enhanced bus lanes would be preferred intervention level.	21% of respondents to the public survey noted a preference for IL3 – the busway (a similar level of support to IL1 and IL2). There is a sense of permanence with the busway as it is established as a separate closed system and less easily removed. This is likely to provide the public with confidence in the investment and future operation of the scheme. Comments within the public survey also noted the 'future proofing' of the busway in terms of the potential opportunity to convert to trams in the future. A comment in the public survey noted the potential difficulty for emergency vehicles to pass traffic if the busway were implemented as the road would only be single carriageway making it harder to pass through traffic (as

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
				emergency vehicles could not use the busway). One bus operator highlighted that the busway would be preferred over bus lanes as it was felt that anything less would be unlikely to provide the journey time savings required. It was noted that IL3 could also improve bus stops and see the introduction of bus rapid transit style stations.
	B	Variants B does not address the constrained road section around the railway bridge at Belmont Road / Leslie Place and requires traffic 'gating' to reallocate queues and provide a level of bus priority through the constrained section. The public survey highlighted only 5% of respondents preferred this variant.		
		✓	✓	✓
	C	Option C includes road widening at Belmont Road / Leslie Place which would allow for a bus lane / busway through this section of currently constrained carriageway. Given the continuous bus priority, the option was viewed more favourably than variant B, with the public survey highlighting 10% of respondents preferred this variant.		
		✓✓	✓✓	✓✓
	D	Option D impacts most heavily on the BCIP scheme and would require changes to the currently committed scheme design. There may be some public opposition, and also confusion to changes to the scheme given its committed status. However, given policy changes and the Scottish Government's commitments in the Updated Climate Change Plan, members of the public may view the variant favourably as being more in line with policy in terms of providing sustainable travel and not introducing additional road capacity for general traffic with Aberdeen. Indeed, the public survey highlighted 17% of respondents preferred this variant, the most preferred of all the route variants. It should be noted that over 50% of respondents to the public survey were based in Aberdeenshire and over half of these (31% of the total survey responses) were from those residing in Inverurie. The greater preference for variant D may be weighted by this, and potentially reflect a preference for more direct access to Union Square by those living in Aberdeenshire. There is likely to be some public opposition to a review of bus service routes into the city centre with those whose routes are altered and who are not benefitting from the changes being most opposed.		
		✓✓	✓✓	✓✓

Criteria	Route Variant	Intervention Level 1: Standard Bus Lanes and active travel route provision	Intervention Level 2: Enhanced Bus Lanes and active travel route provision	Intervention Level 3: Busway and active travel route provision
	E	Similar to route variant C, Option E includes road widening at Belmont Road / Leslie Place to allow for a bus lane / busway through this section of currently constrained carriageway. Option E also does not remove capacity from the BCIP scheme. The public survey highlighted only 8% of respondents preferred this variant.		
		✓	✓	✓

5.4 Appraisal Summary

5.4.1 Table 5.4 below presents a summary of all the scores from the appraisal. Thereafter, the main advantages and disadvantages in relation to the active travel proposals, the three levels of bus intervention and the four route options are shown in the tables that follow.

Table 5.4: - Appraisal Summary – Scores

Assessment Criteria		Intervention Level 1 Standard Bus Lanes and active travel route provision				Intervention Level 2 Enhanced Bus Lanes and active travel route provision				Intervention Level 3 Busway and active travel route provision			
Variant		B	C	D	E	B	C	D	E	B	C	D	E
TPO	1: Improve pedestrian experience	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓
	2: Improve the quality of the cycling experience	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
	3: Improve the quality of bus travel	✓	✓✓	✓	✓✓	✓	✓✓	✓	✓✓	✓	✓✓✓	✓	✓✓✓
	4: Reduce bus journey times and improve punctuality	✓	✓✓	✓	✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓
	5: Improve integration with, and access to, rail services	✓	✓	✓✓	✓	✓	✓	✓✓	✓	✓	✓	✓✓	✓
	6: Manage general traffic re-routeing	✗	✗	✗✗	✗✗	✗✗	✗✗✗	✗✗✗	✗✗✗	✗✗	✗✗✗	✗✗✗	✗✗✗
STAG Criteria	Environment	✓	✓✓	✓	✓✓	✓✓	✓✓✓	✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓
	Safety	✓	✓	✓	✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
	Economy – Active Travel	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
	Economy – Public Transport	✓	✓	✓	✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓
	Economy – General Traffic	✗	✗	✗	✗	✗✗	✗✗	✗✗✗	✗✗	✗✗	✗✗	✗✗✗	✗✗
	Integration	✓✓	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓	✓	✓	✓✓
	Accessibility & Social Inclusion	✓	✓✓	✓	✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓
	Feasibility	✓	✗	✗✗	✗	✓	✗	✗✗	✗	✓	✗	✗✗	✗
	Affordability	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	High	Medium	High
	Public Acceptability – Active Travel	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
	Public Acceptability – Public Transport	✓	✓✓	✓✓	✓	✓	✓✓	✓✓	✓	✓	✓✓	✓✓	✓

Table 5.5: - Appraisal Summary – Key Advantages and Disadvantages – Active Travel options and Bus Priority Intervention Levels

	Advantages	Disadvantages
Pedestrian Improvements	• Safety benefits through reduced conflicts between pedestrians and cyclists due to segregated cycle tracks (between Craibstone and Mounthooly / city centre) • Improved signalised junctions integrated to enable effective pedestrian crossings • Improvements to the pedestrian environment were welcomed by respondents to the public survey (undertaken to support the options appraisal)	
One-way (With Flow) Segregated Cycle Tracks	• Step change improvement to walking, cycling and wheeling provision – with improved safety and security • Reduced pedestrian conflict (on currently signed shared footway areas) • Generally easier to accommodate at large complex signalised junctions • Generally better connectivity to other cycle routes • Response to the public survey, undertaken to support the options appraisal, welcomed segregated cycling infrastructure	• Less space efficient and flexible • Less coherent for users when the cycle track is detached from the road • Cyclists may incorrectly use the track in the wrong direction if it is easier than crossing a major road • Not easily compatible with intervention level 3 (busway)
Two-way Segregated Cycle Track	• Step change improvement to walking, cycling and wheeling provision - with significantly improved safety and security • Reduced pedestrian conflict (on currently signed shared footway areas) • More space efficient (requires less additional land take) • More coherent when the cycle track is detached from the road (e.g., along high-speed roads / dual carriageways) • Quicker to grit / de-ice and remove snow, with likely lower maintenance costs than one way with-flow tracks • 41% of respondents to the public engagement survey, undertaken to support the options appraisal, noted that they would prefer a two-way segregated cycle track (as opposed to one-way (with flow) segregated cycle tracks)	• Connectivity for some cyclists to and from the track can be more difficult to manage • Cycle traffic at risk from both left and right turning traffic entering side roads • Moving between the cycle track and road is more difficult for cyclist travelling against the flow of traffic. • Cyclists may be dazzled by the headlights of oncoming vehicles especially in rural locations where there is no street lighting • Potential for accidents if cyclists are travelling towards each other on steep sections
Intervention Level 1 (Standard bus lanes)	• Adaptable bus scheme - hours of operation or use by other vehicles (e.g., commercial vehicles) could be accommodated if necessary • Introduces fully accessible bus stops • Minimal general traffic journey time or re-routing impacts • Measures partly align with climate change policy	• Less transformational and scores the lowest against many of the study TPOs and STAG criteria • Lower public journey time and reliability benefits • Unlikely to result in a significant increase in bus use due to minimal journey time benefits • Relocation of on-street parking required

	Advantages	Disadvantages
	• 60% of respondents to the public survey noted a preference for some level of bus priority on the corridor (with 19% stating intervention level 1 as their preference)	
Intervention Level 2 (Enhanced bus lanes)	• Adaptable bus scheme – hours of operation or use by other vehicles (e.g., commercial vehicles) could be accommodated if necessary • Significant improvement to bus journey times and service reliability • Likely to increase bus use with environmental and safety benefits and improve opportunities to access jobs and education • Measures align more closely to climate change policy and action • 60% of respondents to the public survey noted a preference for some level of bus priority on the corridor (with 20% stating intervention level 2 as their preference)	• Significant general traffic re-routeing to be managed • Generates increases to general traffic journey times along the corridor • Relocation of on-street parking required
Intervention Level 3 (Busway)	• Transformative change to bus services along the corridor with faster journey times and reliable services • Provides fully accessible bus stops with high quality waiting environments • Likely to increase bus use with greater air quality and safety and benefits • Improves opportunities to access jobs and education • Measure aligns more closely to climate change policy and action • Opportunity to convert the busway to a tramway in the future • 60% of respondents to the public survey noted a preference for some level of bus priority on the corridor (with 21% stating intervention level 3 as their preference)	• Significantly higher cost than intervention level 2 without significantly greater journey time benefits • Bespoke vehicles may be required to operate within the busway which may require investment in new vehicles and associated maintenance / depot requirements • Significant traffic re-routing impacts to be managed • Generates increases to general traffic journey times along the corridor • Scheme generally less adaptable once built • Relocation of on-street parking required

Table 5.6: - Appraisal Summary – Key Features – Option Variants

Route Variant	Route Description (Between Kittybrewster Roundabout and Mounthooly Roundabout / City Centre)	Key Features
B	Routes along the committed BCIP scheme between Kittybrewster roundabout and Powis Terrace, and Powis Terrace / Powis Place to Mounthooly	• Does not provide continuous bus priority and therefore generates the smallest reductions in bus journey times across all route variants • Lowest cost variant (capital cost of active travel and bus measures estimated at £21m - £71m (at 2021 prices) dependent on the intervention level) • Only 5% of respondents to the public survey noted a preference for this route variant

Route Variant	Route Description (Between Kittybrewster Roundabout and Mounthooly Roundabout / City Centre)	Key Features
C	Routes along the committed BCIP scheme between Kittybrewster Roundabout and Powis Terrace, and Powis Terrace / Powis Place to Mounthooly, with road widening at Belmont Road Railway Bridge	• Offers significant bus journey time improvements over variant B due to the provision of continuous bus priority along the corridor between Craibstone and Mounthooly roundabout • Requires costly bridge widening / replacement • High cost variant (capital cost of active travel and bus measures estimated at £33m - £95m (at 2021 prices) dependent on the intervention level) • 10% of respondents to the public survey noted a preference for this route variant
D	Routes along the committed BCIP scheme between Kittybrewster Roundabout and Skene Square, and onwards to Union Square	• Offers the greatest bus journey time improvements for re-routed services to bus / railway station at Union Square but would not benefit (and may produce disbenefits) for passengers going to Powis Terrace / Powis Place etc • Provides continuous bus priority to Aberdeen bus and rail station • Would need sufficient bus services to re-route down Berryden Corridor to justify scheme • Significant increases in general traffic journey times and traffic re-routeing, and as such, has the greatest negative impacts on fuel use and greenhouse gas emissions • Likely to significantly negatively impact on the BCIP objectives and outcomes • Variant cost higher than variant B but lower than variants C and E (capital cost of active travel and bus measures estimated at £23m - £80m (at 2021 prices) dependent on the intervention level) • 17% of respondents to the public survey noted a preference for this route variant
E	Routes along Great Northern Road between Kittybrewster Roundabout and Powis Terrace / Powis Place (does not use BCIP scheme)	• Offers significant bus journey time improvements over variant B • Provides continuous bus priority due to the provision of continuous bus priority along the corridor between Craibstone and Mounthooly roundabout • Requires costly bridge widening / replacement • Requires complex junction redesign at Berryden Corridor / Powis Terrace junction to accommodate the new access to Great Northern Road • High cost variant (capital cost of both active travel and bus measures estimated at £36m - £95m (at 2021 prices) dependent on the intervention level) • Only 8% of respondents to the public survey noted a preference for this route variant

5.5 Selection or rejection of options

5.5.1 The table below presents the key rationale for selection or rejection of options at this stage in the appraisal process. Note that all options below incorporate active travel provision as set out above – using either one-way with flow cycle tracks (in the case of intervention levels 1 and 2) or a two-way cycle track (in the case of intervention levels 1, 2 and 3), as well as improvements to the pedestrians' environment.

Table 5.7: Option Selection or Rejection

Intervention Level	Variant	Select	Rationale for selection or rejection
Intervention Level 1 (Standard bus lanes)	B	✓	Provides bus journey time improvements with less significant impacts to general traffic (than intervention levels 2 or 3) and lower overall costs given no bridge widening (as required under variants C and E).
	C	✓	Provides bus journey time improvements with less significant impacts to general traffic (than intervention levels 2 or 3).
	D	×	While variant D offers the greatest public transport benefits in terms of access to the railway and bus station in Aberdeen, there are likely to be disbenefits to those users whose services are re-routed but who have a destination on Powis Terrace / Powis Place and to the north of the city centre. Stagecoach and FirstBus indicated the key passenger market on Powis Terrace / Powis Place and may be disinclined to reroute services. Variant D also generates the most significant disbenefits to general traffic in terms of traffic re-routeing and subsequent fuel use and associated greenhouse gases. The variant is likely to significantly negatively impact on the BCIP objectives and outcomes and require a redesign of the BCIP scheme to accommodate the proposals. As such, it is likely to be very hard to justify any change to the already committed BCIP scheme and explain the change to the general public.
	E	✓	Provides bus journey time improvements with less significant impacts to general traffic (than intervention levels 2 or 3). Variant E also has less of an impact on the committed BCIP scheme compared to variants B and C.
Intervention Level 2 (Enhanced bus lanes)	B	✓	Provides bus journey time improvements and a transformative scheme that aligns well with national policy and is likely to generate modal shift.
	C	✓	Provides significant bus journey time improvements and a transformative scheme that aligns well with national policy and is likely to generate modal shift.
	D	×	As above for 1D.

Intervention Level	Variant	Select	Rationale for selection or rejection
	E	✓	Provides significant bus journey time improvements and a transformative scheme that aligns well with national policy and is likely to generate modal shift. Variant E also has less of an impact on the committed BCIP scheme compared to variants B and C.
Intervention Level 3 (Busway)	B	×	The additional costs of the busway level of intervention do not correlate to a similar reduction in improved bus journey times. This makes the additional cost of the busway difficult to justify over intervention level 2 (the enhanced bus lanes). The busway would also not be as adaptable as the bus lane intervention levels 1 and 2 and may also require investment in bespoke vehicles / may only be usable by specific vehicles, lowering its overall benefit. Also note comments above for 1D in relation to 3D.
	C	×	
	D	×	
	E	×	

6 Summary and Conclusions

6.1 Summary

6.1.1 This report has presented the development and appraisal of **transformational sustainable travel options** on the A96 which can encourage modal shift towards walking, cycling and public transport. Along with the similar multi-modal corridor studies for Aberdeen's other main arterial routes, this study is also feeding into the development of ART, where the ambition is to develop a **high quality, high frequency mass transit network across the city on key corridors and linking key destinations, anchored by P&R facilities** on each corridor. ART has national recognition within Transport Scotland's draft *Strategic Transport Projects Review 2* (STPR2) and in the Scottish Government's Draft National Planning Framework 4 (NPF4). The work undertaken as part of this A96 Multi-modal study has recognised throughout the need to develop options which could facilitate the successful delivery of ART on the corridor.

6.1.2 Through establishing the problems and opportunities for the corridor, a set of six Transport Planning Objectives were defined:

- **TPO 1** - Improve the quality of the pedestrian experience, and address the barriers which affect people moving around as pedestrians along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre
- **TPO 2** - Improve the quality of the cycling experience, and address the barriers which prevent many people cycling along the A96 corridor between Inverurie and Mounthooly roundabout / Aberdeen city centre
- **TPO 3** - Improve the quality of bus travel in the corridor for all users, enhancing the network and the travel experience both for current bus users and to attract new users
- **TPO 4** - Reduce bus journey times and improve punctuality in the corridor, and narrow the gap between bus and car-based journey times
- **TPO 5** - Improve active travel and bus travel integration with, and access to, rail services in the corridor
- **TPO 6** - Manage general traffic to minimise traffic re-routeing onto secondary and local routes as defined by the North East Roads Hierarchy

6.1.3 These objectives were used, along with the STAG criteria, to appraise the range of options developed with included options for continuous active travel provision along the corridor, three differing levels of bus priority, and five 'route variants' on which to implement the options.

6.2 Conclusions and Next Steps

6.2.1 In terms of **active travel** provision, either continuous segregated one-way (with flow) or two-way cycle tracks could be provided along the corridor between Craibstone roundabout and Mounthooly, with further shared use footway between Craibstone roundabout and Kintore.

6.2.2 While the design principles adopted for this study sought to consider consistency of provision (i.e., the same track type provision throughout), there is the potential at the next stage to consider where it may be more appropriate to implement a mix of both types along the corridor as appropriate (noting that one-way (with flow) tracks can be favoured in more dense urban areas). Improvements to the pedestrian environment are also proposed to increase pedestrian safety and create a more attractive pedestrian setting. The segregation of cyclists and pedestrians, between Craibstone roundabout and Mounthooly roundabout, from the currently provided shared footways is a clear safety benefit.

6.2.3 Of the three **bus intervention levels**, the significant additional costs of the busway level of intervention do not generate a commensurate reduction in bus journey times. This makes the additional cost of the busway difficult to justify over intervention level 2 (the enhanced bus lanes). The busway would also be less adaptable than the bus lane intervention levels 1 and 2 and may also require investment in bespoke vehicles / may only be usable by specific vehicles, lowering its overall benefit. For this reason, it is not recommended that the busway level of intervention be progressed further.

6.2.4 Route variant D provides bus priority to the city centre along the BCIP / Skene Square / Denburn Road (from Kittybrwester roundabout to Union Square) as opposed to on the A96 (from Clifton Road along Powis Terrace / Powis Place to Mounthooly roundabout). Such a route offers the greatest public transport benefits in terms of access to the railway and bus station in Aberdeen, but there would be disbenefits to those users whose services are re-routed but who have a destination on Powis Terrace / Powis Place and to the north of the city centre. Stagecoach and First indicated that the key passenger market is on Powis Terrace / Powis Place and may be disinclined to reroute services.

6.2.5 Route variant D also generates the most significant disbenefits to general traffic in terms of increased travel times, traffic re-routeing and the resulting fuel use and associated greenhouse gases. The variant is likely to negatively impact on the BCIP objectives and outcomes and require a redesign of the BCIP scheme to accommodate the proposals. As such, it may be hard to justify any change to the already committed BCIP scheme and explain the changes to the general public.

6.2.6 For the above reasons, progression of route variant D, across all intervention levels, is not recommended.

6.2.7 The options considered worthy of progression for more detailed appraisal include:

- Both active travel options, one-way segregated (with flow) cycle tracks and a two-way segregated cycle track, as well as footway and junction improvements to improve the pedestrian environment.

- Intervention level 1 (standard bus lanes) and intervention level 2 (enhanced bus lanes) across route variants B, C and E (shown in the diagram below). All three variants route along Powis Terrace / Powis Place with:

    - Variants B and C routeing along the BCIP between Kittybrwester and Clifton Road and Variant E routeing via the retained Great Northern Road

    - Variants C and E including the widening of the railway bridge at Belmont Road to enable continuous bus lanes through this section.

6.2.8 At the next stage of the appraisal, key issues and risks requiring more detailed consideration include:

- **Impacts of road space reallocation** between Craibstone roundabout and Mounthooly roundabout, with the reallocation of a lane of the existing carriageway from general traffic to bus only**.** The potential impacts to all road users needs consideration, especially the potential cumulative impacts of the proposals for the A96 when considered with the proposals for the other corridor studies

- **Loss of on-street parking:** due to the reallocation of road space along the A96, and Great Northern Road (variant E) between Don Street and Clifton Road

- **Highway widening:** need for widening of the highway along the A96 Great Northern Road between Printfield Walk and Kittybrewster roundabout. This requires a widening of

the road into front gardens which, depending on land ownership, could require Compulsory Purchase Order powers

- **Impact on the Berryden Corridor Improvement Project** and the scheme objectives
- **Clifton Road junction design**: layout and operation of the Clifton Road junction will be complicated by the competing priorities from general traffic, bus, cycle, and pedestrian demands
- **Powis Terrace (variants C & E):** proposed widening of Powis Terrace will require the replacement of the Belmont Road railway bridge and the potential construction of a retaining wall alongside the railway south of the bridge

6.2.9 Furthermore, the following design and operations risks need to be considered:

- Availability of third-party land for highway widening
- Grade differences between the east and westbound carriageways which reduces the opportunity for road widening
- Wider traffic impacts due to traffic reassignment, and especially when combined with the proposals for the other key corridors
- Complexity of junction layouts and the method of signal control
- Subway structures that may need to be modified
- Roundabout to signalised junction conversions
- Extent of utility diversions and protection works
- Impact on street lighting
- Waiting and loading restrictions will need to be changed
- Highway infrastructure maintenance liabilities

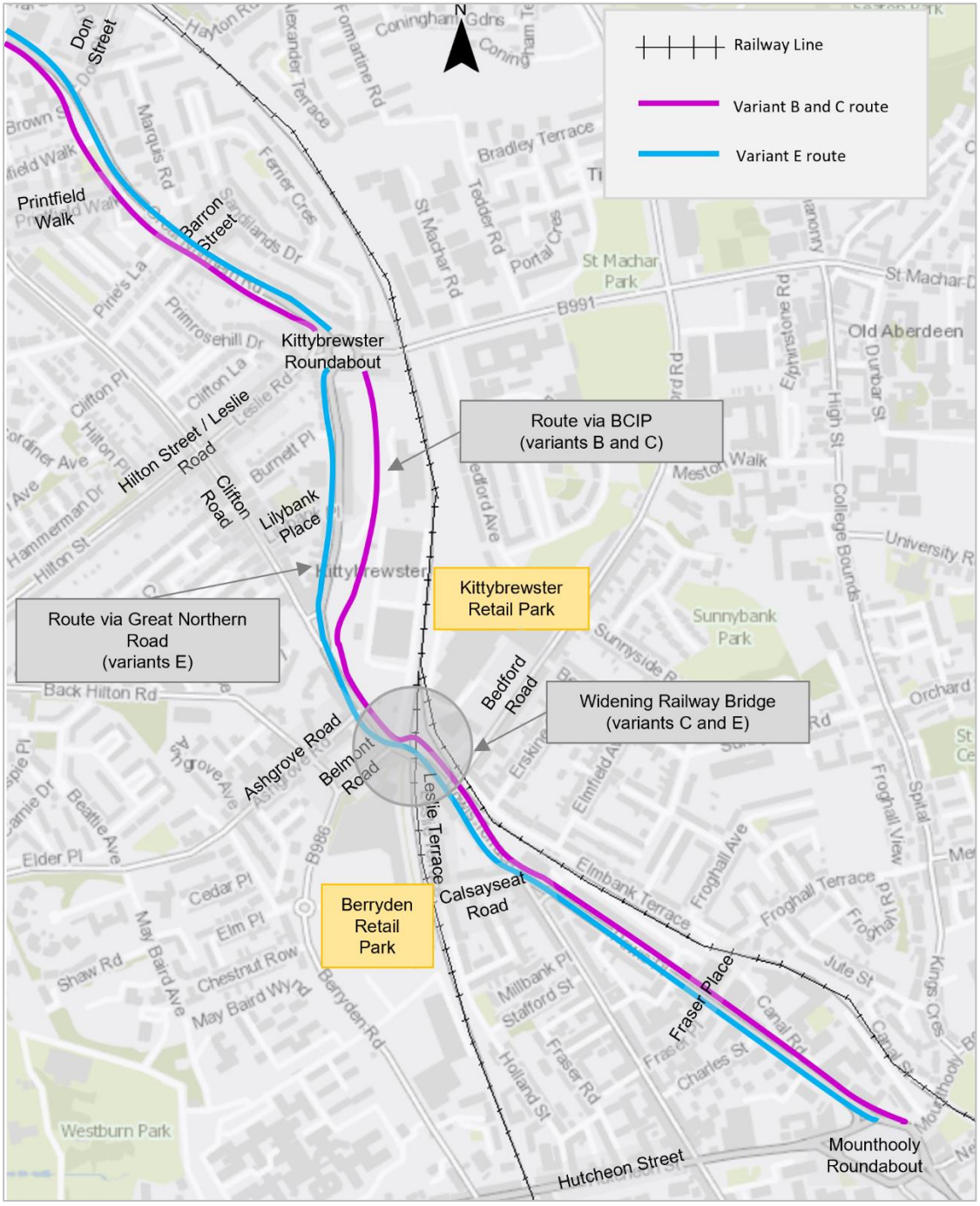


Figure 6.1: Route variants recommended for further consideration

Appendix A Initial Option Sift

Table A:1: Option Generation – Initial sift of options from previous studies

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
Active Travel	Improve pavement surfaces and infrastructure	✓						Do Minimum measure	
	Improve streetlighting in areas with high levels of pedestrian and cycle activity	✓						Do Minimum measure	
	Improve crossings at roundabouts	✓						To be facilitated / considered within all the options	
	Implementation of traffic free cycle highways within the city centre to connect with NCR 195, NCR 1		✓					Two-way segregated cycleway is to be part of all options	
	Cycle priority measures at signalised junctions		✓					To be included within all options where junctions are encountered	
	Introduce Cycle Hire scheme		✓						Plan already in place to be operated by Big Issue ShareBike Ltd which sees ShareBike, an established Norwegian bike hire company, team up with The Big Issue to launch Big Issue eBikes

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	Create cycle hubs for secure cycle parking		✓					Recognised as wider supporting measure – not part of route option development	
	Implement segregated cycle facilities		✓					To be included within all of the options being considered	
	Aberdeen to Blackburn Cycleway		✓					Consideration of previous Aberdeen to Blackburn Cycleway Feasibility study (ACC, 2009) Consideration of Transport Scotland plans with respect to the A96 dualling	
	Kintore to Blackburn cycle link		✓					Option taken forward as per the outcomes of the Kintore to Blackburn Cycle Route – Option 3 Feasibility Study (undertaken by AECOM for Aberdeenshire Council, 2019)	
	Elphinstone Road – Shared use path to link Port Elphinstone to Inverurie and new Hospital campus and provide the link onto the strategic A96 shared use path proposals	✓	✓					Segregated cycle paths are to be considered within all options	

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	A96 Blackhall Roundabout pedestrian and cycle crossing improvements – proposals to be developed to support improved pedestrian and cycle movement across this roundabout junction.	✓	✓					To be facilitated / considered within all the options	Potentially out with remit as it is a trunk road and controlled by TS
	Blackhall Road – Scheme should aim to provide continuity of access for cyclists along the length of Blackhall Road. Options to consider shared use path, segregated cycle on 'up slope' for west bound cyclists	✓	✓						Considered out of scope
	North Street – Shared use path and/or cycle lanes along the length of North Street to link into existing infrastructure at B9001 junction.	✓	✓						Considered out of scope
	A96 Inverurie to Aberdeen Strategic Link – Continue to support the phased delivery of an off-road shared use cycle path linking Inverurie to Kintore Business Park, Kintore, and Blackburn. Would link with Aberdeen City aspirations to continue the link from Blackburn to Aberdeen.	✓	✓					Continuous provision from Inverurie to Aberdeen is key focus of study	
	Town Centre Access Improvements – Working with	✓	✓						Cycle facilities linking Inverurie to A96

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	partners to review and develop options that would improve the access in and around Inverurie town centre for pedestrians and cyclists								cycleway connecting to Kintore already in place.
	A96 Segregated Cycle Route (Craibstone to Aberdeen city centre and linking to TECA)		✓					A fully segregated cycle way is to be included within all options shared use path is already in place between TECA and Dyce)	
	Enhance Cycle Route between Inverurie and Craibstone Park & Ride		✓					Section between Blackburn and Craibstone being considered – Inverurie to Kintore already in place and Kintore to Blackburn feasibility study (2019 – see above) already determined preferred route.	
	Cycle Parking Review		✓					Recognised as wider supporting measure but not being considered as part of corridor option development	
	Improve wayfinding signage		✓					Do Minimum measure	
	Fill in missing links in cycling connections along A96 corridor		✓					To be included within all options where sections	

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
								of the segregated cycle track are not in place	
	Review cycle crossings (incl. roundabouts)		✓					To be facilitated / considered in all options	
	Promote 'Park and Pedal' at Craibstone Park and Ride		✓					Recognised as wider supporting measure but not being considered as part of corridor option development	
Bus	Designation of A96 corridor as Quality Bus Corridor			✓	✓		✓		Being considered through the Aberdeen Rapid Transit – Options Appraisal study
	Statutory Bus Quality Partnership / Enhanced Agreement / Service Improvement Partnership: creation of statutory agreement for A96 Inverurie to Aberdeen Corridor, including the potential for specific agreements to serve key facilities e.g., Craibstone P&R.			✓	✓		✓		Being considered through the Aberdeen Rapid Transit – Options Appraisal study
	Bus / Light Rapid Transit System: e.g., guided busway, segregated from main carriageway or Light Rail Transit e.g., Tram system between the Airport, P&R and Aberdeen City Centre			✓	✓		✓	To be considered during option development	
	Dyce Station – Airport Bus / TECA bus link (Dyce Station – Aberdeen Airport via Dyce business parks			✓	✓				Included in the Dyce Travel Study – this study will develop options to

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	and industrial estates) – opportunities to reinstate bus connections between Dyce Station and Aberdeen Airport								facilitate shorter bus journey times between Aberdeen and the airport / Dyce but not new services
	Bus Image Improvement (corridor-wide)			✓					Recognised as wider supporting measure but not being considered as part of corridor option development
	Implement BRT/Bus Priority schemes which improve bus service journey times and reliability on key corridors in the city and towns in the region			✓	✓		✓	Focus of the study	
	Implement bus only streets on key city centre corridors and introduce bus gates on the approach to city centre junctions in order to annul the impact of congestion on journey times			✓	✓		✓	To be considered as part of options development	
	Install mobility inclusive and significantly improved bus stop infrastructure	✓		✓				Do Minimum measure	
	Express Bus Services (Craibstone P&R along A96 corridor): Introduction of direct, dedicated, branded services along A96 to Aberdeen City Centre, and to			✓	✓				Being considered through the Aberdeen Rapid Transit – Options Appraisal study. This A96 study is considering

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	other key employment areas across Aberdeen								infrastructure and not new services.
	Craibstone P&R Bus Priority: Congestion / queue bypass at roundabout for buses leaving the P&R, two options exist: · Creation of bus only left turn lane to allow buses to bypass queuing left-turn car traffic · Upgrading and utilizing rural roads through the campus of Scotland's Rural College (SRUC) which would directly connect the P&R to the A96 east of the roundabout. Option would likely require a bus gate to be installed to prevent general rat-running			✓	✓		✓		Being considered through the Aberdeen Rapid Transit – Options Appraisal study.
	Explore opportunities to promote additional uses of the Craibstone Park & Ride site e.g., for parcel pick-up services							Recognised as a wider supporting measure	
	Develop a dedicated "P&R" brand for all sites			✓				Recognised as a wider supporting measure – and branding being considered through Aberdeen Rapid Transit – Options Appraisal study	
	Review P&R pricing structures/methods and explore			✓				Recognised as wider supporting measure but	

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	implementation of a cross-P&R site charging structure							noting that fare charging, and structure are not under direct council control.	
	Promote the GrassHOPPER ticket in the context of journeys involving P&R			✓					
	Ticket Marketing (awareness raising – corridor-wide): Media campaigns to promote ticketing options (e.g., Grasshopper). Issuing free 'trial' tickets to businesses / residents as part of re-launch of Craibstone P&R			✓					
	Enhanced Grasshopper / Integrated Public Transport Ticket: explore options for enhanced Grasshopper ticket and / or an integrated bus / rail ticket option for allowing more flexible travel by public transport (bus, P&R, rail) on the corridor			✓		✓			
	Promote development and promotion of Craibstone P&R as a recharging hub			✓				Recognised as wider supporting measure	
	Travel Incentives at Craibstone Park & Ride: Incentives to encourage use of facility e.g., free day/week tickets for first time users			✓			✓	Recognised as wider supporting measure	

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	Explore potential for use of P&R sites as hubs when large events are taking place in the region			✓					Not in scope
	Review waiting room opening hours at Craibstone Park & Ride	✓		✓					Not in scope
	Ensure all directional signs to the P&R emphasise it is free.			✓					Not in scope
	Introduce direct, dedicated services along A96 to Aberdeen City Centre, and to other key employment areas across Aberdeen e.g., ARI, including destinations facilitated by opening of AWPR e.g., Altens			✓					This study is considering infrastructure along the A96 corridor and not new services.
	Access to Bus Services (corridor wide, including promotion of feeder services to hubs on the corridor): Identify areas of low accessibility and consider viability of services to those areas. Consider provision of bus services to rail stations			✓		✓			Bus hubs are already in place at both Inverurie and Kintore train stations
	Real Time Passenger Information (RTPI) systems development (corridor-wide): review RTPI systems to ensure accurate, consistent information displayed to passengers	✓		✓				Do Minimum measure	
Rail	Airport / TECA rail link – would significantly reduce journey times					✓			Explored through Aberdeen North-West

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	and provide a more welcoming arrival experience into the city centre								Station Review – which concluded that the potential for an Aberdeen Airport rail connection based on land safeguarded through development in the area associated with the new TECA development was unfeasible and would require significant land take from a newly constructed industrial estate. Access to the new TECA site from the existing Aberdeen to Dyce railway was considered more appropriate[20]
	Investigate and promote a local Aberdeen based rail service, as well as potential new rail halt locations					✓			Considered out of study scope which is considering infrastructure along the A96 corridor
Public Transport	Investigate the types of improved and smart integrated ticketing schemes that could be					✓		Recognised as a wider supporting measure but noting that fare	

[20] https://www.nestrans.org.uk/wp-content/uploads/2019/06/2019_06_04_FPASTS-Extra-Aberdeen-NW-Stations-Review_Consolidated-Report_Final.pdf

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
	implemented region-wide and coordinate with national schemes							charging, and structure are not under direct council control	
	Investigate types of additional information provision for public transport users that would have the greatest positive impact					✓		Recognised as a wider supporting measure	
Parking	Apply stricter parking standards within the city centre boundary to enforce 'zero parking' for new development		✓					Recognised as a wider supporting measure but to be pursued by Aberdeen City Council	
	Increase the number of conventional as well as city centre electric car club locations in order to allow for incidental car use for residents and businesses without the need for car ownership						✓		Considered out of scope
	Progress a regional Demand Management Study – to include: the potential to raise parking charges and / or extend the current 'controlled' parking areas; introduce a workplace parking levy; and / or a congestion charging zone through the development of a viable Business Case exploring potential alternative charging models		✓				✓	Recognised as a wider supporting measure but to be pursued by Aberdeen City Council	Considered out of scope

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	Improve pedestrian experience	Improve cycling experience	Improve quality of bus travel	Reduce bus journey times	Improve integration with rail services	Manage general traffic to minimise traffic re-routeing	Select	Reject
Electric Vehicles	Extend the network of publicly available charging points for electric vehicles								Out of scope
	Ultra-Low Emission Vehicle (ULEV) 'refuelling' Infrastructure: Identification and development of charging hubs and/or refuelling facilities for ULEVs e.g., battery Electric Vehicle charge points								Out of scope
Road	Mounthooly Roundabout Improvements (forms part of the George Street area traffic management proposals)	✓	✓	✓			✓	To be considered in all options	
	George Street Traffic Management Interventions – to restrict through traffic but retain car park access (required as part of the Schoolhill closure intervention)		✓				✓	To be considered during option development	
	High Occupancy Vehicle (HOV) Lane (Craibstone Park & Ride to Haudagain roundabout): Extension of existing bus lane or conversion of existing bus lane into bus/ HOV lane from the P&R to Haudagain junction with junction priority for bus and HOV.			✓	✓		✓	To be considered during option development	
	Car Club Provision: Feasibility study to identify suitable new						✓		Out of scope

		Transport Planning Objectives							
		1	2	3	4	5	6		
Mode	Option	**Improve pedestrian experience**	**Improve cycling experience**	**Improve quality of bus travel**	**Reduce bus journey times**	**Improve integration with rail services**	**Manage general traffic to minimise traffic re-routeing**	Select	Reject
	locations for Car Club vehicles / spaces on the A96 Corridor								

Appendix B Option Detail and Concept Designs

B.1 Introduction

B.1.1 This appendix provides much greater detail on the individual options under consideration and also provides concept designs for the options.

B.2 Option Detail

B.2.1 The tables below provide detail on the options being considered, first for the active travel components and then for the bus priority measures.

Table B.1: Option Detail – Active Travel Elements

Section		Sub-section	Proposals
I	Inverurie to Craibstone	Blackhall r/a to Inverurie r/a	No proposals
		Inverurie r/a to Thainstone r/a	• Introduce cycle lanes on Mill Lane connecting the shared path that links to the A96. • Create a protected access from the shared path into the westbound cycle lane. • Widen the shared use path to make overtaking easier
		Thainstone r/a to Northern Rd	• Widen the shared use path to make overtaking easier
		Northern Rd to Blackburn	• New section of active travel route (shared-use path provision) alongside A96 carriageway as per Option 2A in *Evaluation and Feasibility Assessment Inverurie to Blackburn A96 Cycle Route, Aberdeenshire Council, September 2017*
		Blackburn to Craibstone	• New section of active travel route alongside A96 carriageway (shared-use path provision)
II	Craibstone to Printfield Walk	Craibstone r/a – Dyce Drive	• Cycle track (two-way) on northern side of the road, or one-way with traffic flow cycle tracks on both side of the carriageway • Access to cycle track via subway – confirm gradients are suitable • Bus stop cycle bypasses required at all eastbound bus stops
		Dyce Drive - Rowett Estate access	• Cycle track (two-way) on northern side of the road, or one-way with traffic flow cycle tracks on both side of the carriageway • Cycle track signal priority at Dyce Drive junction • Upgrade cycle crossing facilities at Dyce Drive junction
		Rowett Estate access - Gough Burn Crescent	• Cycle track (two-way) on northern side of the road, or one-way with traffic flow cycle tracks on both side of the carriageway • Subway structure may constrain provision of cycle track • Bus stop cycle bypasses required at all eastbound bus stops
		Gough Burn Crescent – Sclattie r/a	• Cycle track (two-way) on northern side of the road, or one-way with traffic flow cycle tracks on both side of the carriageway • Signalised crossing for cycle track required at Gough Burn Crescent • Upgrade to cycle crossing facilities at Gough Burn Crescent • Upgrade to signalised crossing to the west of Sclattie r/a
		Sclattie r/a – Bucksburn r/a	• Cycle track (two-way) on northern side of the road or, one-way with traffic flow cycle tracks on both side of the carriageway • New Toucan crossing on Bankhead Avenue • New Toucan crossing on A96 west of the Sclattie r/a • Bus stop cycle bypasses required at all eastbound bus stops • Upgraded priority crossing on Greenburn Drive • Review suitability of subway to access alternative route or convert informal crossing on A96 to Toucan control • Investigate suitability of alternative route via Inverurie Road including a two-way cycle track.

Section		Sub-section	Proposals
		Bucksburn r/a – Auchmill Terrace	• Cycle track (two-way) on northern side of the road or, one-way with traffic flow cycle tracks on both side of the carriageway • New Toucan crossing on A947 • Assess suitability of subway on alternative cycle route • Upgrade priority crossing on Gilbert Road and Church Lane • Upgrade priority crossing on Malcolm Road or close access • Bus stop cycle bypasses required at all eastbound bus stops • Upgrade to crossing east of Old Meldrum Road to Toucan control • New Toucan crossing on Old Meldrum Road • Proximity of railway line creates potential pinch point for cycle track provision • Upgrade to crossing east of Newton Terrace to Toucan control • Assess suitability of alternative off-line route due to road width constraints on A96 between Newton Terrace and Auchmill Terrace
		Auchmill Terrace – Haudagain r/a	• Cycle track (two-way) on northern side of the road or, one-way with traffic flow cycle tracks on both side of the carriageway • Bus stop cycle bypass required at all eastbound bus stops • Investigate road width constraints within this section of A96 • Upgrade priority crossings on retail unit access (Evans Cycles, Pizza Hut) • Upgrade crossing to Toucan control east on Manor Drive • Upgrade crossing to Toucan control west of Haudagain r/a
		Haudagain r/a – Don Street	• Cycle track (two-way) on northern side of the road or, one-way with traffic flow cycle tracks on both side of the carriageway • Bus stop cycle bypasses required at all eastbound bus stops • Upgrade crossing to Toucan control west of Haudagain r/a • Upgrade priority crossing on Great Northern Road accesses and upgrade nearby A96 crossings to Toucan control • Between Anderson Drive and Grandholm Street upgrade two informal crossing to Toucan control • Incorporate the cycle track into the A96 crossing just west of the Don Street junction.
III	Printfield Walk to Calsayseat Road	Printfield Walk – Kittybrewster r/a	• Cycle track (2-way) or one-way with traffic flow cycle tracks on both side of the carriageway and upgraded crossing on Machar Drive • The cycle track would continue to Kittybrewster roundabout before crossing the Great Northern Road just north of the roundabout. This is possible because the junction modification required to get the busway through the Don Street junction makes it easier to accommodate the cycle track alongside it.
		Kittybrewster r/a – Belmont Road (via Great Northern Road)	• Cycle track (2-way) or one-way with traffic flow cycle tracks on both side of the carriageway
		Belmont Road – George Street	• Cycle track (2-way) or one-way with traffic flow cycle tracks on both sides of the carriageway

Section		Sub-section	Proposals
IV	Calsayseat Road to Mounthooly	Calsayseat Road – Mounthooly r/a	• Cycle track (2-way) or, one-way with traffic flow cycle tracks on both side of the carriageway

Table B.2: Option Detail – Bus Elements

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
1: Standard Bus Lanes	A	The absence of any significant delay to bus services and the low use of the layby bus stops, suggests measures cannot be justified based on the current performance of the highway and frequency bus services. The only issue identified was a delay incurred by bus services leaving Inverurie along Elphinstone Road on the approach to the Inverurie roundabout. Therefore, intervention along this section would include: • Roundabout modification to enable a left slip to the A96 eastbound on-slip • Upgrading of bus stop laybys along the A96	Standard bus lanes that would start just after the upstream junction and terminate at an appropriate distance from the downstream junction. The bus lanes would be 3.5 metres wide which would allow a slight widening of the off-side lane for general traffic. The bus lane set-back would be adjusted so that there was no reduction in the capacity of the downstream junction and bus lane length adjusted so that the relocated traffic queue (due to the nearside lane being converted to a bus lane) would not block back to the upstream junction.	Introduces standard east and westbound bus lanes along the Great Northern Road between Don Street and the Kittybrewster roundabout. These bus lanes are staggered because of the road width available (11 metres approx.). It is also potentially possible to provide an eastbound bus lane on the approach to the Belmont Road junction. To accommodate the bus lanes and cycle track there will be a loss of on-street parking along the Great Northern Road between the Printfield Walk and Clifton Road junctions and some localised road widening between Printfield Walk and the Kittybrewster roundabout.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Standard bus lane between Barron Street and Kittybrewster r/a **Westbound:** Standard bus lane between Greenmore Gardens and the Don Street junction stop line
				Kittybrewster r/a – Belmont Road *(via Great Northern Road):* **Eastbound:** Standard bus lane between Lilybank Place and Belmont Road **Westbound:** No Proposals
				Belmont Road – Calsayseat Road: No proposals
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
	B	As per Option 1A.	As per Option 1A.	Variant B uses the additional highway created by the Berryden Corridor scheme (between Kittybrewster roundabout and Clifton Road) to deliver with-flow standard bus lanes between Don Street and the Clifton Road junction with Powis Terrace.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Kittybrewster r/a – Belmont Road *(via BCIP)* **Eastbound:** Standard bus lane **Westbound:** Standard bus lane

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
				Belmont Road – Calsayseat Road: No bus proposals (note that the active travel proposals as noted in the table above would be implemented through this section)
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
	C	As per Option 1A.	As per Option 1A.	This option builds on Variant B by proposing a widening of the road carriageway along Powis Terrace between Clifton Road and George Street allowing a two-way cycle track, improved pedestrian facilities and bus lanes/ busway to be introduced. This highway widening would require a replacement of the Belmont Road railway bridge and a retaining wall alongside the railway between Leslie Terrace and Calsayseat Road. The option proposes standard bus lanes and a continuous cycle track between Don Street and the Mounthooly roundabout utilising the additional proposed road widening along Powis Terrace. Between Don Street and the Clifton Road junction the bus, cycle and walking provision would be the same as Option 1B. To the south of the Clifton Road junction additional bus lanes along Powis Terrace would complement those along Powis Place and Causewayend and where the cycle track would continue adjacent to the eastbound carriageway
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Kittybrewster r/a – Belmont Road *(via BCIP)* **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Belmont Road – Calsayseat Road: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
	D	As per Option 1A.	As per Option 1A.	This option variant builds on Variant B but to the south of the Clifton Road junction, the bus lanes and cycle track are continued along the Berryden Corridor using the road widening along Berryden Road, Caroline Place and Skene Square as delivered by the committed scheme elements of the Berryden Corridor proposals. In recognition that bus operators will not want to re-route all services to using the Berryden Corridor to access the city centre, standard bus lanes are proposed along Powis Place and Causewayend, utilising the existing dual carriageway along this section of the corridor. The bus and cycle provision between Clifton Road and the Mounthooly roundabout is therefore the same as Option 1B.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Kittybrewster r/a – Belmont Road *(via BCIP)* **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Belmont Road – Calsayseat Road: No bus proposals (note that the active travel proposals as noted in the table above would be implemented through this section)
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Clifton Road – Hutcheon Street: **Southbound:** Standard bus lane **Northbound:** Standard bus lane
	E	As per Option 1A.	As per Option 1A.	Under this option variant, between the Kittybrewster roundabout and the Clifton Road junction, the declassified section of the A96 becomes bus and local access only giving bus services and the cycle track a bypass route to the new section of the Berryden corridor. From here, the option is similar to Option 1C.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Kittybrewster r/a – Belmont Road *(via Great Northern Road)* **Eastbound:** Bus and local access only

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
				Westbound: Bus and local access only
				Belmont Road – Calsayseat Road: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Standard bus lane **Westbound:** Standard bus lane
2: Enhanced Bus Lanes	A	As per Option 1A.	• 3.25m wide with-flow bus lanes installed on both sides of the carriageway extending the full length of the link between the major junctions. • Major modification to signalised junctions to incorporate new methods of control that give priority to bus movements and support cycle movements within the 2-way cycle track. • Bus lane pre-signals installed in advance of roundabouts. • All bus stops upgraded with high specification shelters within wide, well-lit waiting areas. Appropriate bus stop clearways, cage markings and kerb heights to make the boarding and alighting environment fully accessible	Similar to Option 1A because the existing road widths restrict any extension of the standard bus lanes. By extending the bus lanes to junction stop lines, a traffic management gating / queue relocation system could be introduced between Don Street and George Street. This would help reduce queueing in sections where it is not possible to accommodate bus lanes and so reduce the risk of bus services being delayed as they travel through this section of the corridor. How this system would operate (gating points, hours of operation, etc.) needs further investigation in addition to assessing the risk of traffic reassigning to other less suitable routes which in turn could delay other bus services There will be a loss of on-street parking and some localised road widening required along the Great Northern Road and Powis Terrace between the Printfield Walk and Clifton Road junctions.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Standard bus lane between Barron Street and Kittybrewster r/a **Westbound:** Standard bus lane between Greenmore Gardens and the Don Street junction stop line
				Kittybrewster r/a – Belmont Road *(via Great Northern Road):* **Eastbound:** Enhanced bus lane between Lilybank Place and Belmont Road **Westbound:** No Proposals
				Belmont Road – Calsayseat Road: No bus proposals (note that the active travel proposals as noted in the table above would be implemented through this section)
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
	B	As per Option 1A.	As per Option 2A	Proposes continuous enhanced bus lanes between Don Street and the Kittybrewster roundabout utilising the new road and road widening delivered by the Berryden Corridor scheme (between Clifton Road and Kittybrewster roundabout) and further required widening between Kittybrewster roundabout the Don Street. Beyond the Clifton Road junction buses enter onto Powis Terrace where the road narrows to a single lane carriageway as it crosses the railway at the Belmont Road junction. The enhanced bus lanes continue both sides of the road along Powis Place and Causewayend.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Kittybrewster r/a – Belmont Road *(via BCIP):* **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Belmont Road – Calsayseat Road: No bus proposals (note that the active travel proposals as noted in the table above would be implemented through this section)
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
	C	As per Option 1A.	As per Option 2A	This variant proposes the same bus, cycling and walking facilities as Option 2B between Printfield Walk and the Clifton Road junctions but utilises proposed widening of Powis Terrace to establish a continuous enhanced bus lane and cycle track provision between Printfield Walk and the Mounthooly roundabout.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Kittybrewster r/a – Belmont Road *(via BCIP):* **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Belmont Road – Calsayseat Road: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
	D	As per Option 1A.	As per Option 2A	This option proposes the same bus, cycling and walking facilities as Option 2B and 2C between Don Street and the Clifton Road junction but utilises the road widening of the committed section of the Berryden Corridor to extend these enhanced bus lanes and cycle track to Wapping Street in the city centre. Again, in recognition that bus operators will not wish to re-route all bus services to use the BCIP and to give cyclists a choice of city centre access routes, enhanced bus lanes are proposed along Powis Place and Causewayend and the cycle track along the length of Powis Terrace, Powis Place and Causewayend. The bus (and cycle) provision between Clifton Road and the Mounthooly roundabout is the same as Option 2C.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Kittybrewster r/a – Belmont Road *(via BCIP):* **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Belmont Road – Calsayseat Road: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Clifton Road to Hutcheon Street: **Southbound:** Enhanced bus lane **Northbound:** Enhanced bus lane
	E	As per Option 1A.	As per Option 2A	The Option 2E is similar to Option 1E but instead of standard bus lanes it uses enhanced bus lanes to increase the level of bus priority along the corridor.
				Printfield Walk – Kittybrewster r/a:

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
				Eastbound: Enhanced bus lane **Westbound:** Enhanced bus lane
				Kittybrewster r/a – Belmont Road *(via Great Northern Road):* **Eastbound:** Bus and local access only **Westbound:** Bus and local access only
				Belmont Road – Calsayseat Road: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
3: Busway	A	As per Option 1A.	• A continuous busway using the full extents of the eastbound carriageway. • The westbound carriageway will be converted to a two-way road for general traffic. • Major junction modifications will be required including the conversion of some roundabouts to signalised junctions and to allow general traffic to cross the busway while some side road closures will be required particularly on the busway side of the road. • New central islands will need to be created to accommodate westbound bus stops and additional	Introduces a busway along the northern side of the carriageway but because of the restricted road widths through this section of the corridor, the busway only extends just beyond the Printfield Walk junction and along the length of Powis Place and Causewayend where the road is dual carriageway. As noted for Option 2A, a traffic management gating / queue relocation system could be introduced between Printfield Walk and Calsayseat Road. This would help reduce queueing in sections where it is not possible to accommodate bus lanes. Also, as per Option 2A, there will be a loss of on-street parking and some localised road widening required along the Great Northern Road and Powis Terrace between the Printfield Walk and Clifton Road junctions.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Standard bus lane between Barron Street and Kittybrewster r/a **Westbound:** Standard bus lane between Greenmore Gardens and the Don Street junction stop line
				Kittybrewster r/a – Belmont Road *(via Berryden Corridor):* **Eastbound:** Enhanced bus lane between Lilybank Place and Belmont Road **Westbound:** No Proposals
				Belmont Road – Calsayseat Road: No proposals (note that the active travel proposals as noted in the table above would be implemented)

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
			crossing facilities introduced to connect these stops to the footways on each side of the road	**Calsayseat Road - Mounthooly r/a:** **Eastbound:** Enhanced bus lane **Westbound:** Enhanced bus lane
	B	As per Option 1A.	As per Option 3A	Proposes a busway between the Printfield Walk and Clifton Road junctions utilising a new road and road widening delivered by the BCIP. Beyond the Clifton Road junction buses enter onto Powis Terrace where the road narrows to a single lane carriageway as it crosses the railway at the Belmont Road junction. The busway picks up again along Powis Place and Causewayend, located within the eastbound lanes of the dual carriageway
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Busway (2-way) **Westbound:** No proposal
				Kittybrewster r/a – Belmont Road *(via BCIP):* **Eastbound:** Busway (2-way) **Westbound:** No proposal
				Belmont Road – Calsayseat Road No proposals (note that the active travel proposals as noted in the table above would be implemented)
				Calsayseat Road Mounthooly r/a: **Eastbound:** Busway (2-way) **Westbound:** No proposal
	C	As per Option 1A.	As per Option 3A	The option proposes the same bus, cycling and walking facilities as Option 3B between Printfield Walk and the Clifton Road junctions but utilises the proposed widening of Powis Terrace to establish a continuous busway between Printfield Walk and the Mounthooly roundabout (the cycle track provision would be the same as Option 3B).
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Busway (2-way) **Westbound:** No proposal
				Kittybrewster r/a – Belmont Road *(via BCIP):* **Eastbound:** Busway (2-way) **Westbound:** No proposal

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
				Belmont Road – Calsayseat Road: **Eastbound:** Busway (2-way) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Busway (2-way) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
	D	As per Option 1A.	As per Option 3A	The option variant proposes the same bus, cycling and walking facilities as Option 3B and 3C between Printfield Walk and the Clifton Road junction but utilises the road widening of the BCIP to extend the busway and cycle track to Wapping Street in the city centre. Again, recognising that bus operators will not wish to reroute all bus services to use the BCIP and to give cyclists a choice of city centre access routes, enhanced bus lanes are proposed along Powis Place and Causewayend and a continuous cycle track along Powis Terrace, Powis Place and Causewayend. The bus and cycle provision between Clifton Road and the Mounthooly roundabout is the same as Option 2D.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Busway (2-way) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
				Kittybrewster r/a – Belmont Road *(via BCIP):* **Eastbound:** Busway (2-way) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
				Belmont Road – Calsayseat Road: **Eastbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Enhanced bus lane

Intervention Level	Option	Section I Inverurie to Craibstone	Section II Craibstone to Printfield Walk	Section III & IV Printfield Walk to Mounthooly
				Westbound: Enhanced bus lane
				Clifton Road to Hutcheon Street: **Southbound:** Busway (2-way) **Northbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
	E	As per Option 1A.	As per Option 3A	This option variant is similar to Option 1E and 2E, but the standard or enhanced bus lanes are replaced with a busway that utilises the road widening (at the Bedford Road bridge) proposed within this option, and as per Option 3C.
				Printfield Walk – Kittybrewster r/a: **Eastbound:** Busway (2-way) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
				Kittybrewster r/a – Belmont Road *(via Great Northern Road):* **Eastbound:** Bus and local access only **Westbound:** Bus and local access only
				Belmont Road – Calsayseat Road: **Eastbound:** Busway (2-way) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)
				Calsayseat Road - Mounthooly r/a: **Eastbound:** Busway (2-way) **Westbound:** No proposal (note that the active travel proposals as noted in the table above would be implemented)

Appendix C ASAM Modelling

C.1 Introduction

C.1.1 This appendix provides information about the Aberdeen Sub Area model (ASAM) used for the quantitative analysis in the appraisal of the options, and how it has been used. Individual appendices are provided following this appendix, which set out how ASAM outputs were used to inform the various parts of the appraisal and present the various elements of the analysis.

C.2 ASAM14

C.2.1 ASAM is a multi-modal transport model and covers the main road and public transport network of Aberdeen City and Aberdeenshire. It was developed by Nestrans in partnership with Aberdeen City and Aberdeenshire Councils, the Strategic Development Planning Authority and Transport Scotland. The current version ASAM14 has a base year of 2014, and an update (ASMA19) is currently being developed to reflect observed travel patterns following the opening of the Aberdeen Western Peripheral Route and will create a new base year of 2019.

C.2.2 Transport Scotland manage requests for access to information from their national model (Transport Model for Scotland) and various regional models, including ASAM, from their Land-use and Transport Integration in Scotland (LATIS) website. A request was made, and granted, by Transport Scotland to use ASAM14 for this study.

C.2.3 The ASAM14 model network is shown in the figure below.

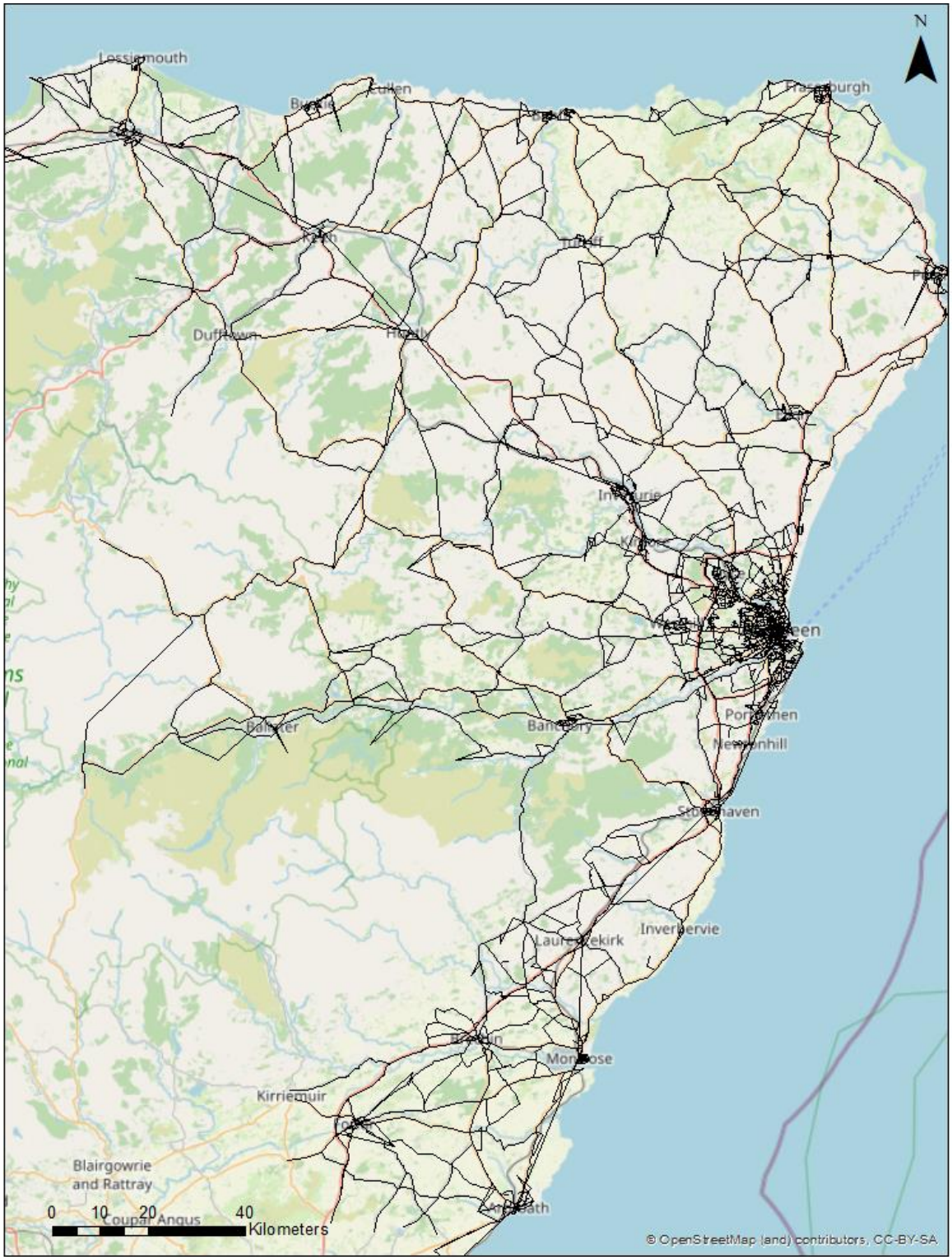


Figure C:2: ASAM14 modelled road network

C.2.4 ASAM14 represents the road and public transport network and service supply present during 2014 and 2014 levels of population and employment activity. The model is calibrated and validated to reflect 2014 observed traffic and travel conditions. ASAM14 aligns with the Land use And Transport Integration in Scotland (LATIS) national model hierarchy 2014 base year and is informed through the TMfS14 / TELMoS14 land use and transport interaction and forecasting processes.

C.2.5 ASAM14 is capable of forecasting changes in travel demand and travel patterns over time, identifying potential impacts from new developments, and assessing the benefits associated with proposed transport investment and policies.

C.2.6 It is noted in the Transport Scotland ASAM document material that the use of ASAM14 is beneficial in Outline and Strategic Business Case development – providing travel demand forecasts and cost benefit analysis for major proposals. This reflects its use as part of this study.

C.3 Use of ASAM14 for this study

C.3.1 Given the scale of the impacts of some of the options (developed with the transformational step change design in mind), it was agreed with the client group that it would be beneficial to understand more quantitatively, the impacts of the options on both general traffic and public transport. Various modelling methodologies were explored to enable the impacts to be understood, recognising the potential for wider strategic re-routeing due to the options.

C.3.2 It is recognised that ASAM14 could be considered 'dated' in 2022. However, the update to ASAM19 is as yet not completed, and reflecting a proportionate approach to appraisal at STAG Preliminary Options Appraisal stage, it was agreed that the ASAM14 forecast years of 2027 and 2037, which include (amongst other committed schemes) the Aberdeen Western Peripheral Route as a committed scheme, was the most suitable tool to provide a robust overarching indication of the potential impacts of the options being considered here.

C.3.3 Outputs from ASAM14 have been used to provide quantitative information covering four elements:

- An understanding of the **general traffic strategic re-routeing** impacts across Aberdeen – this is important given the scale of the schemes
- An understanding more quantitatively of the **modal shift impacts** of the options – through use of the ASAM demand model
- Data to feed into the derivation of **Hansen connectivity analysis** relating to access to employment
- General traffic and public transport **inputs to TUBA** to derive cost benefit ratios for each option (this was not part of the original approach)

C.3.4 With a Do Minimum reference case and 12 options to be modelled, across three time periods and two future years, this represented a significant model coding and analysis workload. In order to ensure a level of proportionality in the models use, it was agreed that the Option C variants would be used to run the full *demand model* process, with the *assignment model* then run individually for all options.

C.3.5 The C variants were considered to likely represent the 'best case' scenario for bus passengers (as the variant provide continuous bus lanes along the A96 corridor) with no bus re-routeing (as in variant D). The option can therefore be considered to also represent the likely 'worst case' scenario for general road traffic. In this regard, the demand model runs represent the modal shift anticipated under this option variant.

C.3.6 The ASAM model developer, SYSTRA, was responsible for undertaking the analysis required and engaged with the project team on appropriate option coding, including junction modelling, and on the outputs required. Outputs provided included:

- Cost, time and distance skims for road and public transport input into TUBA software for the TEE economic analysis and derivation of benefit cost ratios. The journey time skims were also the key input into the Hansen connectivity analysis.

- Images showing traffic flow differences between the options and Do Minimum reference case. Given the number of options being modelled, these outputs were provided for the intervention level 3 (B, C, D and E) variants for 2037 only.

- Traffic flow data across the A96 to enable comparisons between the Do Minimum reference case and options.

- Bus journey time data for services using the A96 – with both data for the Do Minimum reference case and options to enable comparison of bus journey times.

Appendix D Public Transport Journey Time Analysis

D.1 Introduction

D.1.1 In order to understand the benefit to travel by bus from the measures proposed under each of the options, bus journey time data (for services on the A96 corridor) has been obtained from the ASAM14 model for the reference case and modelled future years of 2027 and 2037. This has been used to consider both the absolute and percentage change in travel time and compare travel times with the equivalent car travel time.

D.2 Public Transport Journey Time Analysis – Results

D.2.1 Bus services journey times for services 10, 16, 17 20X and 727 have been obtained from ASAM for each option and time period for the years 2027 and 2037. The routes of these services are shown in Figure D:3.

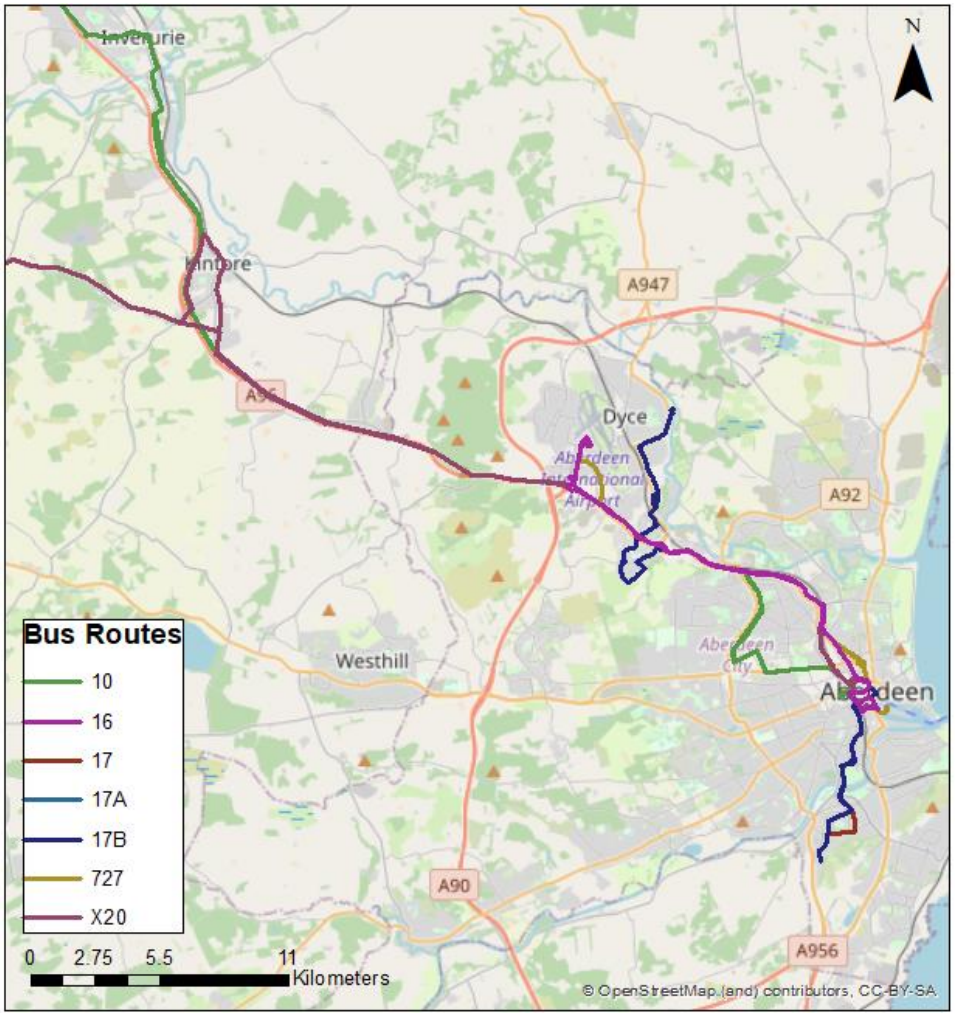


Figure D:3: Bus Routes for Analysis

D.2.2 The figures below show the journey time (in minutes) for each of these bus routes in both the outbound direction (NB-WB) and inbound direction (SB-EB) for the AM, IP, and PM modelled peak hours respectively. Therefore, Figure D:4, Figure D:5 and Figure D:6 show a summary of the journey time changes for these routes in each option, time period and future year of 2037 compared to the Do Minimum (reference) scenario.

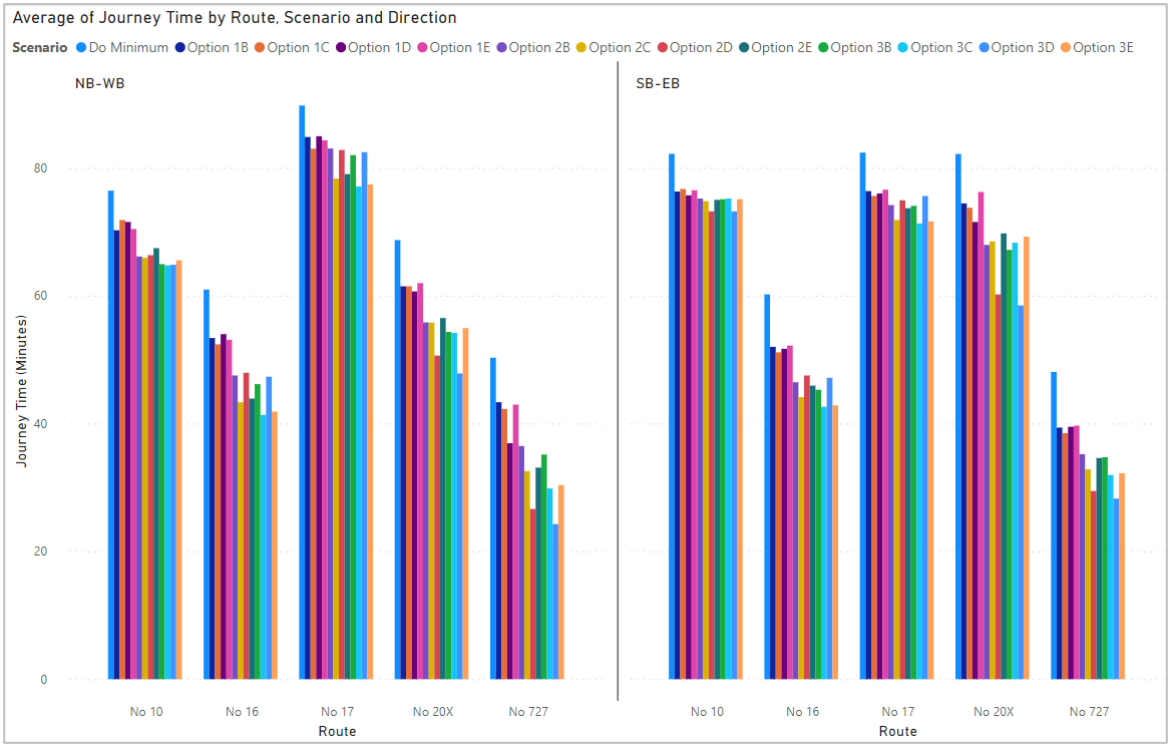


Figure D:4: Bus Journey Time Comparisons – 2037 AM Peak Hour

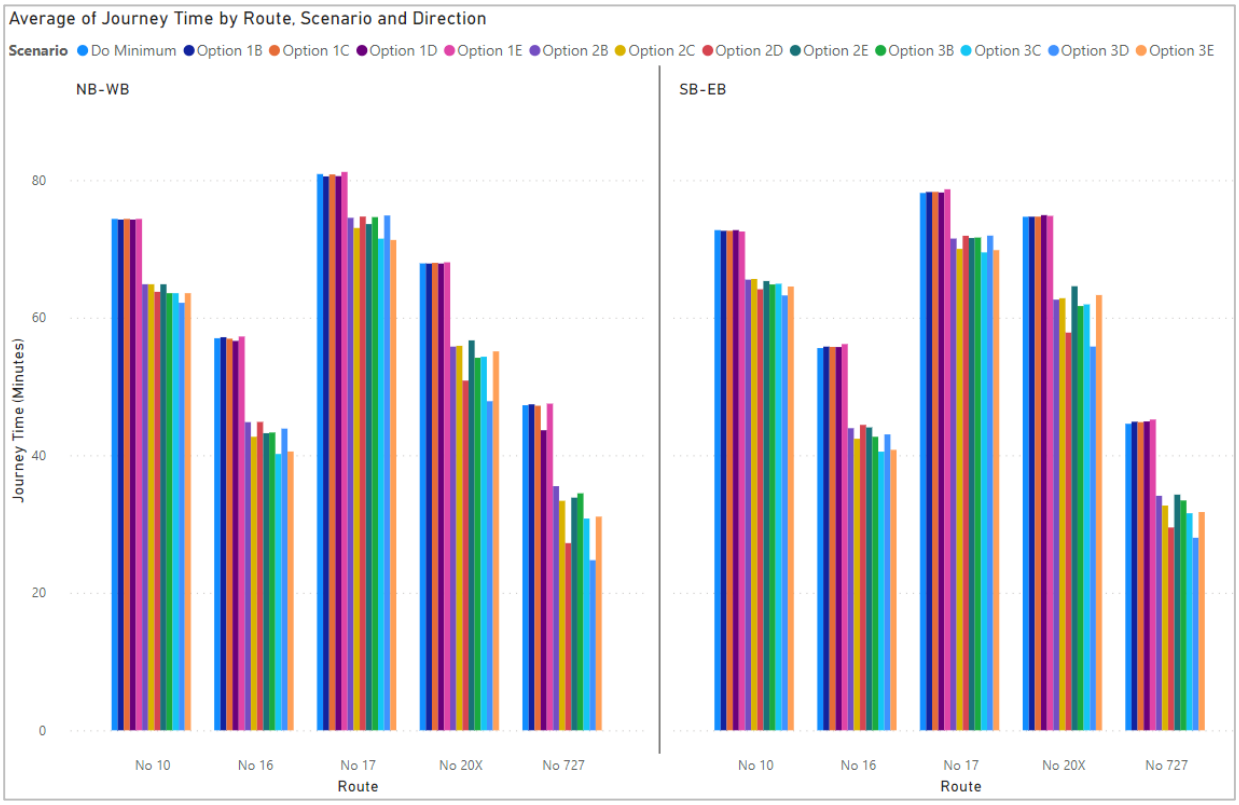


Figure D:5: Bus Journey Time Comparisons – 2037 IP Peak Hour

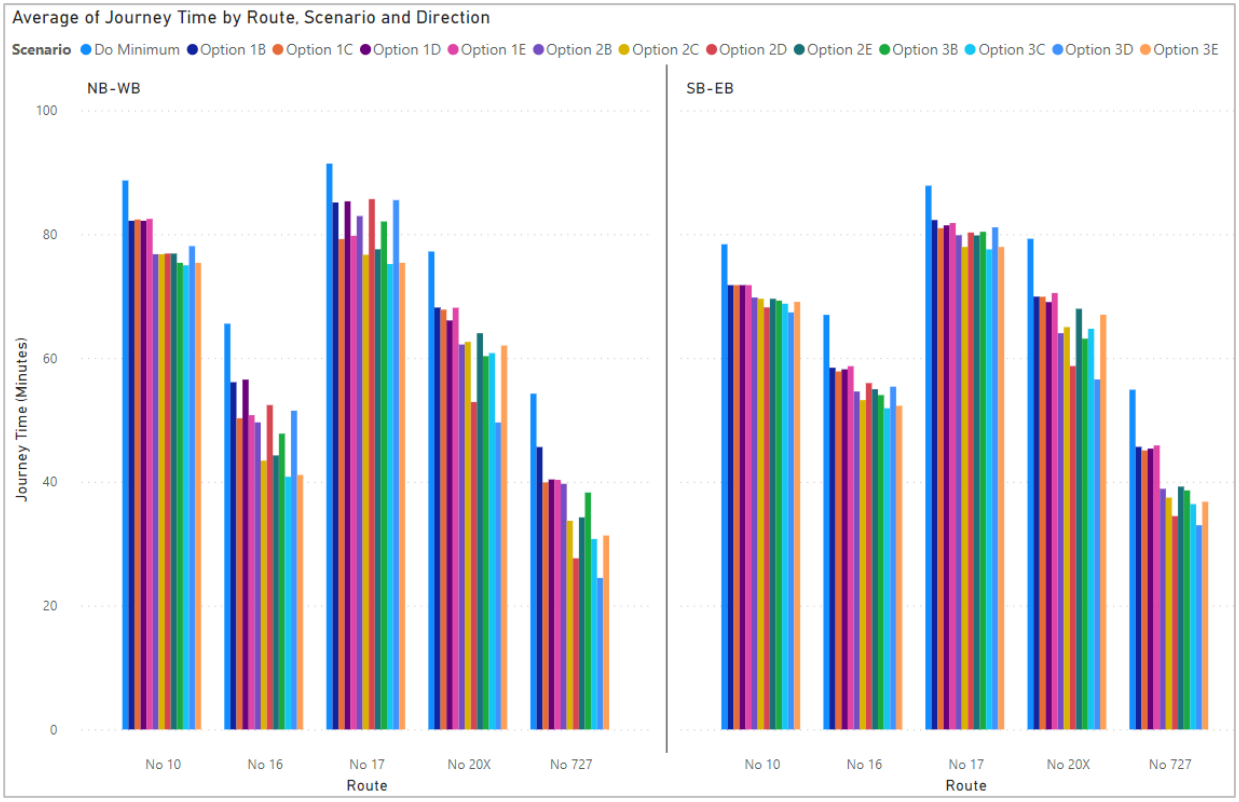


Figure D:6: Bus Journey Time Comparisons – 2037 PM Peak Hour

Table D:3: Route 10 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options)

Route: No 10 Journey Time (Minutes)

Northbound - Westbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	75	0	72	0	84	0
Option 1B	69	-6	72	0	78	-6
Option 1C	69	-6	72	0	78	-6
Option 1D	69	-6	72	0	78	-6
Option 1E	69	-6	72	0	78	-6
Option 2B	64	-11	63	-9	73	-11
Option 2C	64	-11	63	-9	73	-11
Option 2D	65	-9	62	-10	73	-11
Option 2E	64	-11	63	-9	73	-11
Option 3B	62	-12	62	-10	71	-13
Option 3C	63	-12	62	-10	71	-13
Option 3D	63	-12	61	-11	71	-13
Option 3E	64	-10	62	-10	71	-13

Southbound - Eastbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	78	0	71	0	76	0
Option 1B	73	-5	71	0	69	-7
Option 1C	73	-5	71	0	69	-7
Option 1D	73	-6	71	0	69	-6
Option 1E	73	-5	71	0	69	-7
Option 2B	71	-7	64	-6	67	-8
Option 2C	71	-7	64	-6	68	-8
Option 2D	69	-9	63	-8	66	-9
Option 2E	71	-7	64	-6	67	-9
Option 3B	71	-8	64	-7	67	-9
Option 3C	71	-8	64	-7	67	-9
Option 3D	68	-10	62	-9	65	-10
Option 3E	71	-8	64	-7	67	-8

Northbound - Westbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	76	0	74	0	89	0
Option 1B	70	-6	74	0	82	-7
Option 1C	72	-5	74	0	82	-6
Option 1D	72	-5	74	0	82	-7
Option 1E	70	-6	74	0	82	-6
Option 2B	66	-10	65	-10	77	-12
Option 2C	66	-11	65	-10	77	-12
Option 2D	66	-10	64	-11	77	-12
Option 2E	67	-9	65	-10	77	-12
Option 3B	65	-12	64	-11	75	-13
Option 3C	65	-12	64	-11	75	-14
Option 3D	65	-12	62	-12	78	-11
Option 3E	66	-11	64	-11	75	-13

Southbound - Eastbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	82	0	73	0	78	0
Option 1B	76	-6	73	0	72	-7
Option 1C	77	-6	73	0	72	-7
Option 1D	76	-7	73	0	72	-7
Option 1E	76	-6	73	0	72	-7
Option 2B	75	-7	66	-7	70	-9
Option 2C	75	-7	66	-7	70	-9
Option 2D	73	-9	64	-9	68	-10
Option 2E	75	-7	65	-7	70	-9
Option 3B	75	-7	65	-8	69	-9
Option 3C	75	-7	65	-8	69	-10
Option 3D	73	-9	63	-10	67	-11
Option 3E	75	-7	65	-8	69	-9

D.2.3 Route 10 shows a reduction in travel time across all options except all route variants (B, C, D & E) of intervention level 1 in the interpeak where the journey time is similar to that of the Do Minimum. For intervention level 1 (route variants B, C, D and E) there is a journey time reduction of 6 minutes in the AM and PM peaks in the northbound (outbound of Aberdeen) direction. Intervention level 2 (all route variants) and intervention level 3 (all route variants) shows similar journey time reductions ranging from 9 to 14 minutes in the northbound direction (with the greatest reduction for Option 3C in the PM period). This represents an approximate 25% reduction in public transport travel time from the Do Minimum under Option 3C.

D.2.4 The journey time savings in the southbound (inbound to Aberdeen) direction were slightly less than in the northbound (outbound) direction. Intervention level 1 (all route variants) shows no benefit in the interpeak but did show a saving of 5 to 7 minutes in the AM and PM peaks (with the greatest reduction under the Option 1D). Intervention levels 2 and 3 showed similar reductions of 6 to 10 minutes. Option 3D showed the largest journey time reduction overall of 11 minutes in the PM peak, a reduction of 14%. Within intervention level 2 the largest reduction was under Option 2D in the PM peak by 10 minutes a reduction of 13%.

D.2.5 The results for 2037 showed were similar to the 2027 results. The journey time savings vary by at most 2 minutes from the savings reported in 2027.

Table D:4: Route 16 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options)

Route: No 16 Journey Time (Minutes)

Northbound - Westbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	59	0	55	0	62	0
Option 1B	51	-8	55	0	53	-8
Option 1C	50	-9	55	0	49	-13
Option 1D	51	-8	55	0	53	-8
Option 1E	51	-8	55	0	49	-12
Option 2B	46	-13	44	-11	47	-15
Option 2C	43	-16	42	-13	43	-19
Option 2D	46	-13	44	-11	49	-13
Option 2E	43	-16	43	-12	43	-18
Option 3B	44	-15	43	-13	45	-16
Option 3C	40	-19	40	-15	40	-21
Option 3D	45	-14	43	-12	48	-14
Option 3E	41	-18	40	-15	40	-21

Southbound - Eastbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	56	0	54	0	62	0
Option 1B	48	-8	54	0	54	-8
Option 1C	47	-9	54	0	53	-9
Option 1D	48	-8	54	0	54	-8
Option 1E	48	-8	54	1	54	-8
Option 2B	43	-13	43	-10	51	-11
Option 2C	41	-15	42	-12	49	-13
Option 2D	44	-12	44	-10	51	-11
Option 2E	43	-13	44	-10	51	-11
Option 3B	42	-14	42	-12	50	-12
Option 3C	39	-16	40	-14	47	-15
Option 3D	43	-13	42	-11	50	-12
Option 3E	40	-16	40	-13	48	-14

Northbound - Westbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	61	0	57	0	66	0
Option 1B	53	-8	57	0	56	-9
Option 1C	52	-9	57	0	50	-15
Option 1D	54	-7	57	0	57	-9
Option 1E	53	-8	57	0	51	-15
Option 2B	48	-13	45	-12	50	-16
Option 2C	43	-18	43	-14	43	-22
Option 2D	48	-13	45	-12	52	-13
Option 2E	44	-17	43	-14	44	-21
Option 3B	46	-15	43	-14	48	-18
Option 3C	41	-20	40	-17	41	-25
Option 3D	47	-14	44	-13	51	-14
Option 3E	42	-19	41	-16	41	-24

Southbound - Eastbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	60	0	56	0	67	0
Option 1B	52	-8	56	0	58	-9
Option 1C	51	-9	56	0	58	-9
Option 1D	52	-9	56	0	58	-9
Option 1E	52	-8	56	1	59	-8
Option 2B	46	-14	44	-12	55	-12
Option 2C	44	-16	42	-13	53	-14
Option 2D	48	-13	44	-11	56	-11
Option 2E	46	-14	44	-12	55	-12
Option 3B	45	-15	43	-13	54	-13
Option 3C	43	-18	41	-15	52	-15
Option 3D	47	-13	43	-13	55	-12
Option 3E	43	-17	41	-15	52	-15

D.2.6 Intervention level 1 showed little change in journey time in the interpeak but did show journey time savings of 8-9 minutes in the AM peak and 8-13 minutes in the PM peak in the westbound direction (outbound of Aberdeen). The 13 minutes saving were under Option 1C which is a 21% journey time reduction. Journey time savings were similar in the eastbound direction (inbound) in the AM peak and interpeak. In the PM peak journey time savings are smaller with up to 9 minutes of savings. Option 1C showed the largest journey time reduction of 9 minutes in the AM and PM peaks which are reductions of 16% and 15% respectively.

D.2.7 Intervention levels 2 and 3 show larger journey time reductions than level 1. Intervention level 3 shows slightly larger journey time reductions than Intervention level 2. Intervention level 2 shows journey time reductions between 13 and 19 minutes in the westbound (outbound) direction while Intervention level 3 showed reductions between 13 and 21 minutes. Options 2C and 3C were responsible for the largest reductions within each intervention level with reductions of 31% in Option 2C and 34% in Option 3C compared to the Do Minimum. Option 3E also showed the same reduction of (21 minutes) as Option 3C in the PM peak. In the eastbound (inbound) direction, intervention level 2 showed reductions between 10 and 15 minutes while intervention level 3 showed reductions between 11 and 16 minutes. For intervention level 2, the largest reduction (of 15 minutes) was shown in Option 2C in the AM peak, a reduction of 27%. For intervention level 3, the largest reduction (of 16 minutes) was shown in Options 3C and 3E in the AM peak, a reduction of 29%.

D.2.8 The 2037 results were similar to the 2027 results. In most cases the journey time changes only differed by 1 or 2 minutes. The largest reduction was on Option 3C in the PM peak (westbound – outbound from Aberdeen) with a reduction of 25 minutes compared to 21 minutes in 2027.

Table D:5: Route 17 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options)

Route: No 17 Journey Time (Minutes)

Northbound - Westbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	87	0	78	0	85	0
Option 1B	81	-5	78	-1	80	-6
Option 1C	80	-6	78	0	75	-10
Option 1D	81	-6	78	-1	80	-6
Option 1E	81	-6	78	0	76	-10
Option 2B	80	-6	74	-5	78	-8
Option 2C	77	-10	71	-7	73	-12
Option 2D	80	-7	72	-6	79	-6
Option 2E	77	-9	72	-6	74	-11
Option 3B	79	-8	73	-6	77	-8
Option 3C	75	-12	69	-10	72	-13
Option 3D	80	-7	72	-6	79	-6
Option 3E	76	-11	69	-9	72	-13

Southbound - Eastbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	78	0	75	0	84	0
Option 1B	73	-6	76	0	78	-5
Option 1C	72	-6	76	0	78	-5
Option 1D	73	-6	75	0	79	-5
Option 1E	73	-5	76	1	79	-5
Option 2B	71	-7	70	-6	77	-7
Option 2C	69	-9	68	-7	75	-8
Option 2D	72	-6	70	-5	78	-6
Option 2E	71	-7	70	-5	77	-7
Option 3B	71	-7	70	-6	78	-5
Option 3C	69	-10	68	-8	76	-8
Option 3D	72	-6	70	-5	78	-5
Option 3E	69	-9	68	-7	76	-8

Northbound - Westbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	90	0	81	0	91	0
Option 1B	85	-5	81	0	85	-6
Option 1C	83	-7	81	0	79	-12
Option 1D	85	-5	81	0	85	-6
Option 1E	84	-5	81	0	80	-12
Option 2B	83	-7	75	-6	83	-8
Option 2C	78	-11	73	-8	77	-15
Option 2D	83	-7	75	-6	86	-6
Option 2E	79	-11	74	-7	78	-14
Option 3B	82	-8	75	-6	82	-9
Option 3C	77	-13	71	-9	75	-16
Option 3D	82	-7	75	-6	86	-6
Option 3E	77	-12	71	-10	75	-16

Southbound - Eastbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	82	0	78	0	88	0
Option 1B	76	-6	78	0	82	-6
Option 1C	76	-7	78	0	81	-7
Option 1D	76	-6	78	0	81	-6
Option 1E	77	-6	79	1	82	-6
Option 2B	74	-8	72	-7	80	-8
Option 2C	72	-11	70	-8	78	-10
Option 2D	75	-7	72	-6	80	-8
Option 2E	74	-9	72	-7	80	-8
Option 3B	74	-8	72	-6	80	-7
Option 3C	71	-11	69	-9	78	-10
Option 3D	76	-7	72	-6	81	-7
Option 3E	72	-11	70	-8	78	-10

D.2.9 Intervention level 1 showed journey time reductions of up to 10 minutes (12%) in the PM peak in the northbound (outbound) direction. This applies to Options 1C and 1E, the reductions in the other route variations of intervention level 1 are up to 6 minutes with little journey time change in the interpeak. The interpeak also showed little journey time change in the southbound (inbound) direction. In the AM and PM peaks the southbound (inbound) direction shows journey time reductions of up to 6 minutes (8%) with little change between the variations.

D.2.10 Intervention level 2 showed journey time reductions of between 5 and 12 minutes in the northbound (outbound) direction and between 5 and 9 minutes in the southbound (inbound)

direction. The largest reduction was from Options 2C. The 12-minute northbound (outbound) reduction was in the PM peak and corresponds to a journey time reduction of 14%. The 9-minute southbound (inbound) reduction was in the AM peak and corresponds to a journey time reduction of 12%.

D.2.11 Intervention level 3 showed similar results to Option 2 albeit with slightly larger reductions. In the northbound (outbound) direction the journey time savings ranged from 6 to 13 minutes. The 13-mintue reduction was observed in Option 3C and Option 3E in the PM peak and correspond to a 15% reduction in journey time. In the southbound (inbound) direction the journey time savings ranged from 5 to 10 minutes. The 10-minute reduction was shown in Option 3C and corresponds to a 13% reduction in journey time.

D.2.12 The 2037 results are similar to the 2027 results. In some cases, the journey time reductions have increased by up to 3 minutes. The largest reduction was in Option 3C and 3E northbound (outbound) in the PM peak with a reduction of 16 minutes (18%).

Table D:6: Route 20X – Journey Time Comparison – Peak Hour (Do Minimum vs. Options)

Route: No 20X Journey Time (Minutes)

Northbound - Westbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	68	0	66	0	73	0
Option 1B	60	-8	66	0	65	-8
Option 1C	60	-8	66	0	65	-8
Option 1D	59	-9	66	0	63	-10
Option 1E	60	-7	66	0	65	-8
Option 2B	55	-13	55	-11	59	-14
Option 2C	55	-13	55	-11	59	-14
Option 2D	50	-18	50	-16	52	-21
Option 2E	55	-12	56	-11	60	-13
Option 3B	53	-14	53	-13	57	-16
Option 3C	53	-14	53	-13	57	-16
Option 3D	47	-21	47	-19	49	-24
Option 3E	54	-13	54	-12	58	-15

Southbound - Eastbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	79	0	72	0	77	0
Option 1B	71	-8	72	0	67	-9
Option 1C	71	-8	72	0	68	-9
Option 1D	69	-10	72	0	67	-10
Option 1E	72	-7	73	0	68	-9
Option 2B	67	-13	62	-10	63	-14
Option 2C	67	-13	62	-10	64	-13
Option 2D	60	-20	57	-15	58	-19
Option 2E	68	-11	63	-9	66	-10
Option 3B	66	-13	61	-12	62	-15
Option 3C	66	-13	61	-12	63	-14
Option 3D	58	-21	55	-17	56	-21
Option 3E	67	-12	62	-10	65	-12

Northbound - Westbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	69	0	68	0	77	0
Option 1B	61	-7	68	0	68	-9
Option 1C	61	-7	68	0	68	-9
Option 1D	61	-8	68	0	66	-11
Option 1E	62	-7	68	0	68	-9
Option 2B	56	-13	56	-12	62	-15
Option 2C	56	-13	56	-12	63	-15
Option 2D	51	-18	51	-17	53	-24
Option 2E	57	-12	57	-11	64	-13
Option 3B	54	-14	54	-14	60	-17
Option 3C	54	-15	54	-14	61	-16
Option 3D	48	-21	48	-20	50	-28
Option 3E	55	-14	55	-13	62	-15

Southbound - Eastbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	82	0	75	0	79	0
Option 1B	74	-8	75	0	70	-9
Option 1C	74	-8	75	0	70	-9
Option 1D	72	-11	75	0	69	-10
Option 1E	76	-6	75	0	71	-9
Option 2B	68	-14	63	-12	64	-15
Option 2C	68	-14	63	-12	65	-14
Option 2D	60	-22	58	-17	59	-21
Option 2E	70	-12	65	-10	68	-11
Option 3B	67	-15	62	-13	63	-16
Option 3C	68	-14	62	-13	65	-15
Option 3D	58	-24	56	-19	57	-23
Option 3E	69	-13	63	-11	67	-12

D.2.13 Intervention level 1 showed journey time savings of between 7 and 10 minutes in the AM and PM peaks in both directions. The 10-minute reductions were both from Option 1D and relate to a 15% and 13% reduction respectively. In the interpeak there were no journey time reductions.

D.2.14 Intervention level 2 showed larger journey time reductions ranging from 11 to 21 minutes in the northbound (outbound) direction and between 9 and 20 minutes in the southbound (inbound) direction. The largest reductions are seen in Option 2D. The northbound (outbound) reduction of 21-minutes was in the PM peak corresponds to a journey time reduction of 29%. The largest reduction in the southbound (inbound) direction of 20-minutes was in the AM peak and corresponds to a journey time reduction of 25%.

D.2.15 Intervention level 3 showed larger journey time reductions than intervention level 2 with reductions of between 12 and 24 minutes northbound (outbound) and between 10 and 21 minutes southbound (inbound). As with intervention level 2 the largest reductions are seen with route variant D.

D.2.16 The 2037 results showed similar but larger reductions than the 2027 results. The largest changes were with Options 2D and 3D in the northbound direction in the PM peak which see reductions of 24 and 28 minutes respectively (up from 21 and 24 minutes in 2027). In the southbound direction the largest reduction was in Option 3D with reductions of 24 minutes in the AM peak and 23 minutes in the PM peak.

Table D:7: Route 727 – Journey Time Comparison – Peak Hour (Do Minimum vs. Options)

Route: No 727 Journey Time (Minutes)

Northbound - Westbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	49	0	46	0	51	0
Option 1B	42	-7	46	0	43	-8
Option 1C	40	-9	46	0	38	-12
Option 1D	36	-13	42	-3	37	-13
Option 1E	41	-8	46	0	39	-12
Option 2B	36	-13	35	-11	37	-14
Option 2C	32	-17	33	-13	32	-18
Option 2D	27	-22	27	-19	27	-24
Option 2E	33	-16	34	-12	33	-18
Option 3B	34	-15	34	-12	35	-15
Option 3C	30	-19	30	-15	30	-21
Option 3D	24	-25	25	-21	24	-26
Option 3E	30	-19	31	-15	30	-20

Southbound - Eastbound 2027

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	45	0	43	0	50	0
Option 1B	37	-8	43	0	41	-9
Option 1C	37	-9	43	0	41	-9
Option 1D	37	-8	43	0	41	-9
Option 1E	38	-8	43	1	41	-9
Option 2B	34	-11	33	-9	36	-14
Option 2C	32	-13	32	-11	35	-15
Option 2D	29	-17	29	-14	32	-18
Option 2E	34	-12	34	-9	37	-13
Option 3B	34	-12	33	-9	37	-13
Option 3C	31	-14	31	-11	34	-16
Option 3D	28	-18	28	-15	31	-19
Option 3E	31	-14	31	-11	34	-15

Northbound - Westbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	50	0	47	0	54	0
Option 1B	43	-7	47	0	46	-9
Option 1C	42	-8	47	0	40	-14
Option 1D	37	-13	44	-4	40	-14
Option 1E	43	-7	48	0	40	-14
Option 2B	36	-14	36	-12	40	-15
Option 2C	33	-18	33	-14	34	-21
Option 2D	27	-24	27	-20	28	-27
Option 2E	33	-17	34	-13	34	-20
Option 3B	35	-15	34	-13	38	-16
Option 3C	30	-20	31	-16	31	-23
Option 3D	24	-26	25	-23	24	-30
Option 3E	30	-20	31	-16	31	-23

Southbound - Eastbound 2037

Time Period	AM		IP		PM	
Scenario	Journey Time	Change from DM	Journey Time	Change from DM	Journey Time	Change from DM
Do Minimum	48	0	45	0	55	0
Option 1B	39	-9	45	0	46	-9
Option 1C	39	-10	45	0	45	-10
Option 1D	39	-9	45	0	45	-10
Option 1E	40	-8	45	1	46	-9
Option 2B	35	-13	34	-10	39	-16
Option 2C	33	-15	33	-12	37	-17
Option 2D	29	-19	29	-15	34	-20
Option 2E	35	-13	34	-10	39	-16
Option 3B	35	-13	33	-11	39	-16
Option 3C	32	-16	32	-13	36	-18
Option 3D	28	-20	28	-17	33	-22
Option 3E	32	-16	32	-13	37	-18

D.2.17 Intervention level 1 showed journey time savings of between 7 and 13 minutes in the AM and PM peaks in the northbound (outbound) direction. The 13-minute reduction was from Option 1D in both the AM and PM peak and corresponds to journey time reductions of 27% and 25% respectively. In the interpeak there were no journey time reductions apart from Option 1D which showed a reduction of 3 minutes northbound (outbound). In the southbound (inbound) direction there were journey time reductions between 8 and 9 minutes in the AM and PM peaks with no changes in the interpeak. All variants of intervention level 1 showed a 9-minute reduction in the PM peak corresponds to a journey time reduction of 18%.

D.2.18 Intervention level 2 showed larger journey time reductions ranging from 11 to 24 minutes in the northbound (outbound) direction and between 9 and 18 minutes in the southbound (inbound) direction. The largest reductions are seen in Option 2D in the PM peak. The 24-minute reduction northbound (outbound) corresponds to a 47% reduction. The 18-minute reduction southbound (inbound) corresponds to a 36% reduction.

D.2.19 Intervention level 3 showed larger journey time reductions than intervention level 2 with reductions of between 12 and 25 minutes northbound and between 9 and 19 minutes southbound. As with intervention level 2 the largest reductions are seen with route variant D.

D.2.20 The 2037 results showed similar but larger reductions than the 2027 results. The largest changes are with Options 2D and 3D in the northbound (outbound) direction in the PM peak which see reductions of 27 and 30 minutes respectively (up from 24 and 26 minutes in 2027). In the southbound (inbound) direction the largest reduction was in Option 3D with reductions of 20 minutes in the AM peak and 22 minutes in the PM peak.

D.3 Bus vs Car Journey Times

D.3.1 To provide context to the journey time reductions experienced with the options in place, a comparison has been made of the car and public transport journey times between the options. This has been done for Craibstone Park and Ride to Aberdeen City Centre (ASAM zones 205 and 3 used as a proxy for these locations) and is presented in the table below the results provided are for the 2037 AM peak.

Table D:8: Car vs Bus – Journey Time Comparison (by option)

Scenario	Car Journey Time (Mins)	PT Journey Time (Mins)	Difference
DM	26	83	57
1B	28	74	46
1C	27	73	46
1D	28	69	41
1E	28	74	46
2B	28	70	42
2C	28	68	39
2D	30	59	29
2E	28	69	41
3B	28	70	41
3C	29	67	38
3D	30	58	28
3E	29	67	38

D.3.2 The results show that the car journey times are similar across all options although journey times are up to 4 minutes higher than the Do Minimum in Option 3D. The public transport journey times have reduced by up to 25 minutes.

D.3.3 Overall, the public transport journey times are much higher than car journey times across all options. A factor in this will be the walk times associated with accessing public transport.

D.3.4 It is likely that the car journey times reflect congestion already within the network. The reduction in road capacity has led to an increased journey time but has also resulted in strategic re-routing which will have reduced the overall impact on car journey times.

D.3.5 The public transport results show that Option 3D offers the largest journey time reduction with a 25-minute saving compared to the Do Minimum. Intervention level 1 shows the smallest public transport journey time saving with Options 1B and 1E offering a 9-minute reduction in journey time. Intervention level 2 offers public transport journey time reductions ranging from 13 minutes (Option 2B) to 24 minutes (Option 2D).

D.3.6 The results show that public transport journey time saving is larger than the car journey time increase across all options.

D.4 Bus Journey Times – Cumulative Analysis

D.4.1 To demonstrate the public transport journey time improvements, time-distance diagrams have been prepared to compare each option and the Do Minimum.

D.4.2 Journey times have been compared for Route 727 which runs between Aberdeen Airport and Aberdeen City Centre as shown in Figure D:7. The results are shown for the 2037 AM peak.

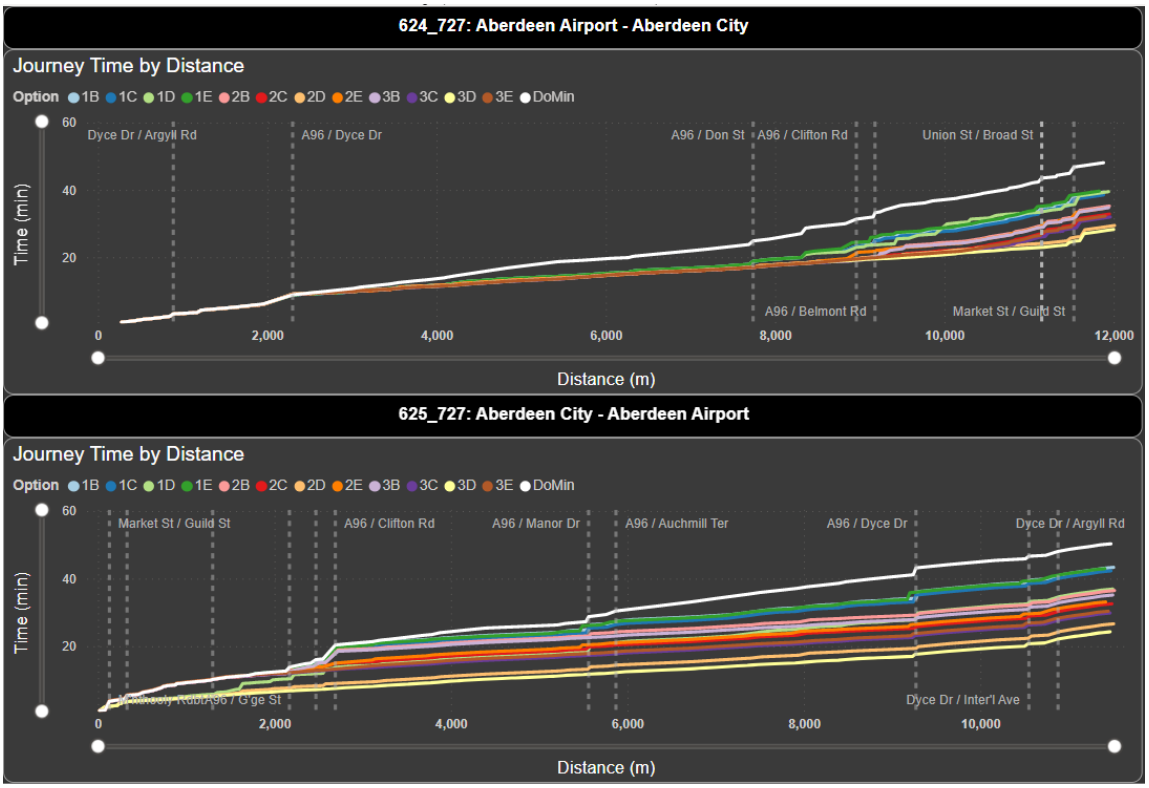


Figure D:7 Route 727 Journey Time – 2037 AM Peak

D.4.3 The results show that all options provide a journey time saving on Route 727. The route from the airport to the city centre shows steadily increasing journey time savings between the Dyce Drive and Don Street junctions on the A96. Journey times are similar across all options until around the Belmont Road junction where the journey times begin to diverge. By the end of the route, it can be seen that Options 2D and 3D offer the largest journey time reduction of around 20 minutes. Options 1D and 1E offer the smallest savings of around 10 minutes.

D.4.4 Route 727 from the city centre to the airport also shows that there are journey time savings across all options. The options show immediate journey time savings from the city centre however the journey times are close around George Street. The options show additional journey time saving compared to the Do Minimum on the A96 between Auchmill Terrace and Dyce Drive. Options 2D and 3D offer the largest journey time savings of around 25 minutes. Options 1B, 1C and 1E show the smallest journey time reductions of around 8 minutes.

D.4.5 Journey times have also been compared for bus route 17 which runs between Fauld's Gate and Dyce. Figure D:8 presents the journey times for each option in the 2037 AM peak.

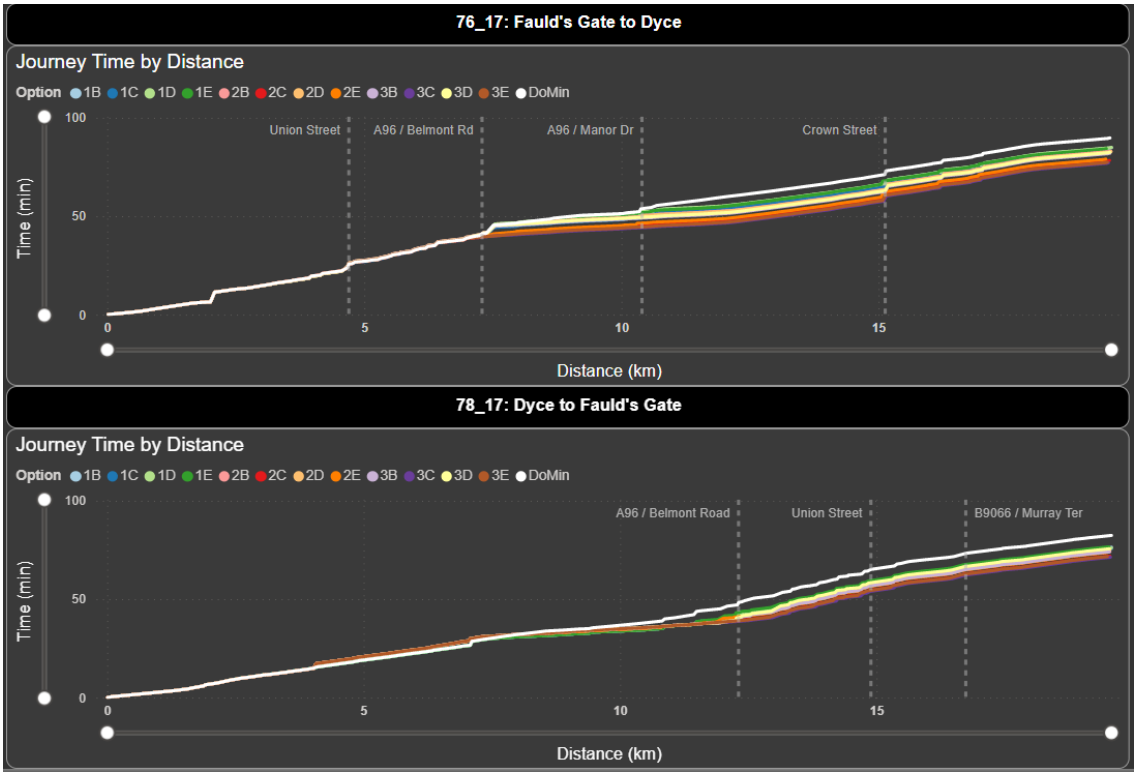


Figure D:8 Route 17 Journey Time – 2037 AM Peak

D.4.6 The figure shows that journey times in all options are similar from Fauld's Gate up to the Belmont Road junction on the A96. After this junction the options show quicker journey times than the Do Minimum. Journey time savings on this route are less significant than Route 727. The smallest journey time reductions are around 5 minutes with journey time reductions of up to 12 minutes under Option 3C.

D.4.7 Between Dyce and Fauld's Gate the results are similar to the opposite direction. Journey time reductions are seen on the approach to the Belmont Road junction on the A96 up to the Union Street junction. Journey time savings are similar to the opposite direction, ranging from 5 to 10 minutes.

Appendix E Strategic Re-routeing

E.1 Introduction

E.1.1 To provide an indication of the strategic re-routeing impacts occurring with the options in place, flow difference information (between the Do Minimum and the options) at five key locations along the A96 route has been considered. In addition, flow difference plots over the wider Aberdeen city area are provided to understand the potential wider re-routeing predicted with the options in place.

E.2 Flow Differences

E.2.1 Two-way flow day covering the full 24hr period was obtained from ASAM at the following points on the A96:

- A96 – West of A90 (AWPR)
- A96 – East of Craibstone
- A96 – Auchmill Rd, East of Old Meldrum Rd
- A96 – Woodside
- A96 – North of Belmont Road
- A96 – North of Mounthooly

E.2.2 Table E shows the total change in (2037 Actual) flow from the Do Minimum for each option.

Table E:1: 24 hr two-way flow change from Do Minimum

Intervention Level	Variant	A96 West of A90 (AWPR)	A96 East of Craibstone	A96 Auchmill Rd, East of Old Meldrum Rd	A96 Woodside	A96 North of Belmont Road	A96 North of Mounthooly
1	B	-99	-450	-2,258	-885	-163	-87
	C	-122	-455	-2,280	-798	55	193
	D	-30	-356	-2,161	-649	250	329
	E	-89	-540	-2,204	-811	-782	-123
2	B	-2,553	-7,551	-14,897	-8,142	-1,277	-1,675
	C	-2,606	-7,649	-14,887	-8,213	-2,929	-2,176
	D	-2,549	-7,563	-14,908	-7,965	908	-18
	E	-2,669	-7,682	-14,910	-8,018	-2,796	-1,976
3	B	-3,084	-9,100	-15,188	-9,075	-1,897	-2,201
	C	-3,143	-9,198	-15,194	-9,243	-3,508	-2,638
	D	-3,095	-9,091	-15,283	-9,114	-88	-492
	E	-3,161	-9,182	-15,221	-9,163	-3,564	-2,574

Table E:2: 24 hr two-way flow reduction percentage compared to Do Minimum

Intervention Level	Variant	A96 West of A90 (AWPR)	A96 East of Craibstone	A96 Auchmill Rd, East of Old Meldrum Rd	A96 Woodside	A96 North of Belmont Road	A96 North of Mounthooly
1	B	0%	-1%	-5%	-3%	-1%	-1%
	C	0%	-2%	-5%	-3%	0%	2%
	D	0%	-1%	-4%	-2%	2%	3%
	E	0%	-2%	-5%	-3%	-5%	-1%
2	B	-6%	-25%	-30%	-30%	-8%	-13%
	C	-6%	-25%	-30%	-31%	-18%	-17%
	D	-6%	-25%	-30%	-30%	6%	0%
	E	-6%	-25%	-30%	-30%	-17%	-16%
3	B	-7%	-30%	-31%	-34%	-12%	-18%
	C	-7%	-31%	-31%	-34%	-22%	-21%
	D	-7%	-30%	-31%	-34%	-1%	-4%
	E	-7%	-30%	-31%	-34%	-22%	-21%

E.2.3 The results show an overall reduction of vehicles on the A96 with the most significant reductions on A96 Auchmill Road, East of Old Meldrum Road.

E.2.4 There are some flow reductions (up to 7%) on the A96 prior to the A90 junction in the West. After the A90 junction the flow reductions on the A96 are much more pronounced with reductions between 25% and 34% under intervention levels 2 and 3 between Craibstone and Woodside. Flows on the A96 are lower than the Do Minimum East of Woodside but the change is smaller than shown further West on the A96.

E.2.5 The flow reductions indicate strategic re-routing as a result of reduced road capacity. The locations of flow changes indicate that vehicles are likely using the A90 to the West of Aberdeen rather than the A96. There is also potential re-routing onto the A92 to the North which could then be joining the A96 around Woodside.

E.2.6 Intervention level 1 showed the least significant changes with flow reductions of up to 5%. Small flow increases were shown North of Belmont Road to the city centre in Options 1C and 1D. Flows are similar between all route variants of intervention level 1.

E.2.7 The intervention level 2 results are much more significant than intervention level, 1 with flow reductions of up to 31%. The A96 East of Craibstone showed a 25% reduction in all variations of intervention level 2 with 30% reductions shown East of Old Meldrum Road and Woodside. East of Woodside, there are some differences between the route variants. Option 2D shows a 6% increase in flow compared to the Do Minimum while Options 2B, 2C and 2E also show reductions. Option 2D has higher flow between Woodside and Mounthooly Roundabout.

E.2.8 The intervention level 3 results are similar to the intervention level 2 results; however, the reductions are even larger. All route variations of intervention level 3 show similar flow reductions West of the A90 (7% reduction) and between Craibstone and Woodside (30% - 34% reduction).

E.2.9 As with Option 2D, the results for Option 3D are notably different to the other route variants between Woodside and the Mounthooly Roundabout. Option 3D showed a small reduction

between 1% to 4% on this section of the A96 whereas Options 3C and 3E showed reductions over 20%. Option 3B falls between the other options with reductions between 12% and 18%.

E.2.10 Overall, the results showed a significant reduction of flows on the A96. The most notable reductions are between Craibstone and Woodside. The flow reductions indicate that there was significant re-routing within the network.

E.3 Strategic Re-routeing

E.3.1 Flow difference plots were provided for the intervention level 3 option route variants B, C, D and E compared to the Do Minimum and are shown below for 2037.

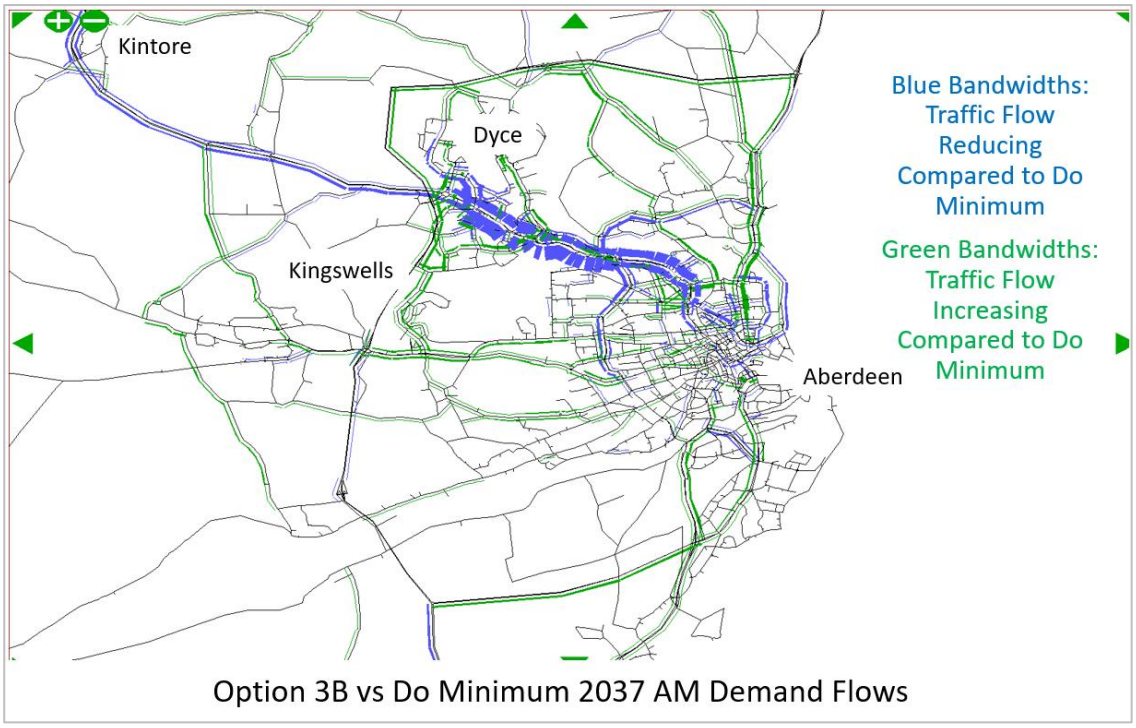


Figure E:1: Option 3B Flow Differences from Do Minimum

E.3.2 The flow difference plot for Option 3B shows a large reduction of flow on the A96 in both directions. This is due to additional congestion on the A96 as a result of the bus lanes. The reduced A96 capacity has led to strategic re-routing with additional flows observed on other key routes into Aberdeen. The most significant flow reduction is on the A96 between Dyce and Aberdeen, however there is still a reduction on the A96 between Kintore and Dyce.

E.3.3 Key flow increases include on the AWPR north of Dyce and then joining the A92 to the north of Aberdeen. There is also increased flow on the roads running through Kingswells and Skene to the west of Aberdeen.

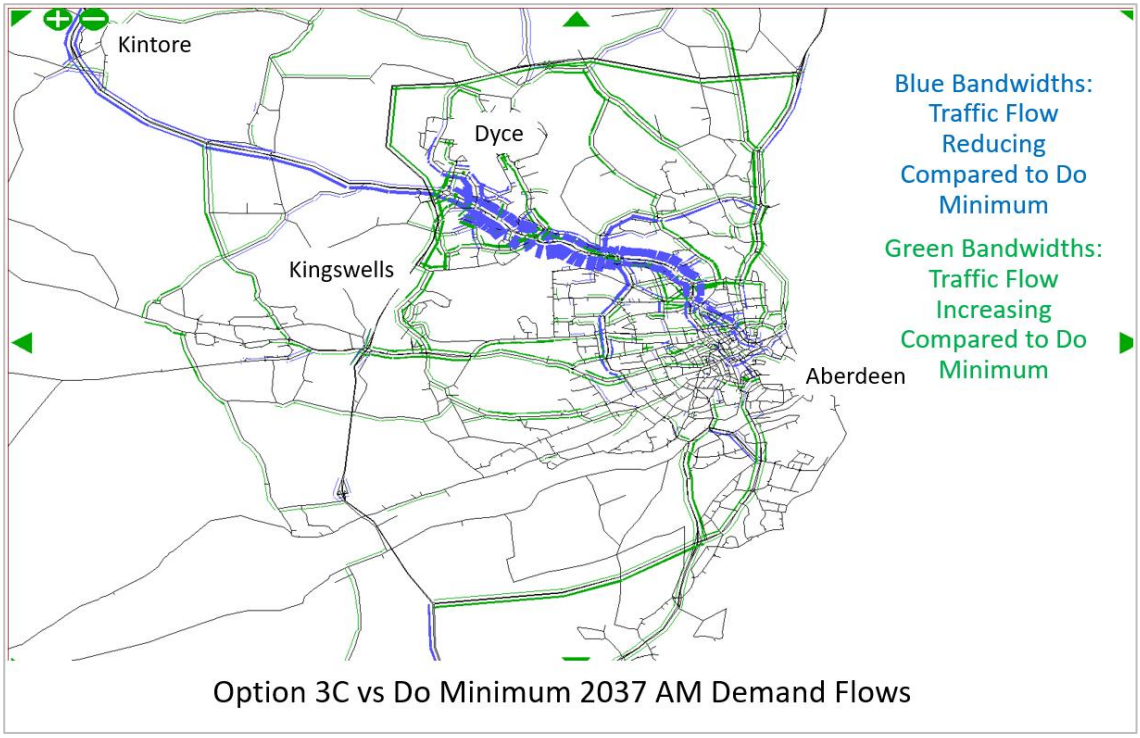


Figure E:2 Option 3C Flow Differences from Do Minimum

E.3.4 The flow differences shown in Option 3C are very similar to Option 3B. The flow reduction on the A96 is very similar with increases observed on the A92 and through Skene and Kingswells.

E.3.5 The only notable changes from Option 3B were in the northeast of Aberdeen with flow increases shown on Esplanade in Option 3C whereas this was a flow reduction in Option 3B. This is potentially showing that congestion elsewhere in the network has led to increased flow on the A92 corridor.

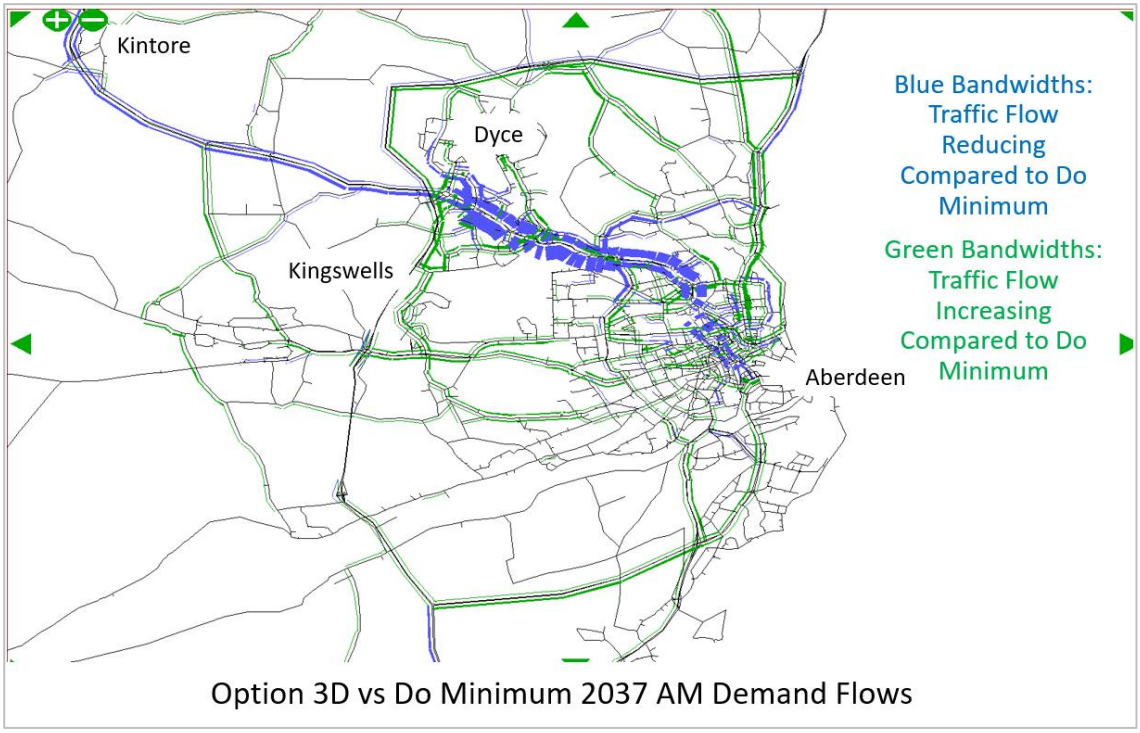


Figure E:3: Option 3D Flow Differences from Do Minimum

E.3.6 Option 3D shows similar flow changes on all of the strategic corridors as Options 3B and 3C. The key difference from Options 3B and 3C is further increased reductions on the A96 between Kittybrewster and Aberdeen City Centre. Other routes such as the A92 to the north have increased flow to compensate for the additional A96 flow reductions.

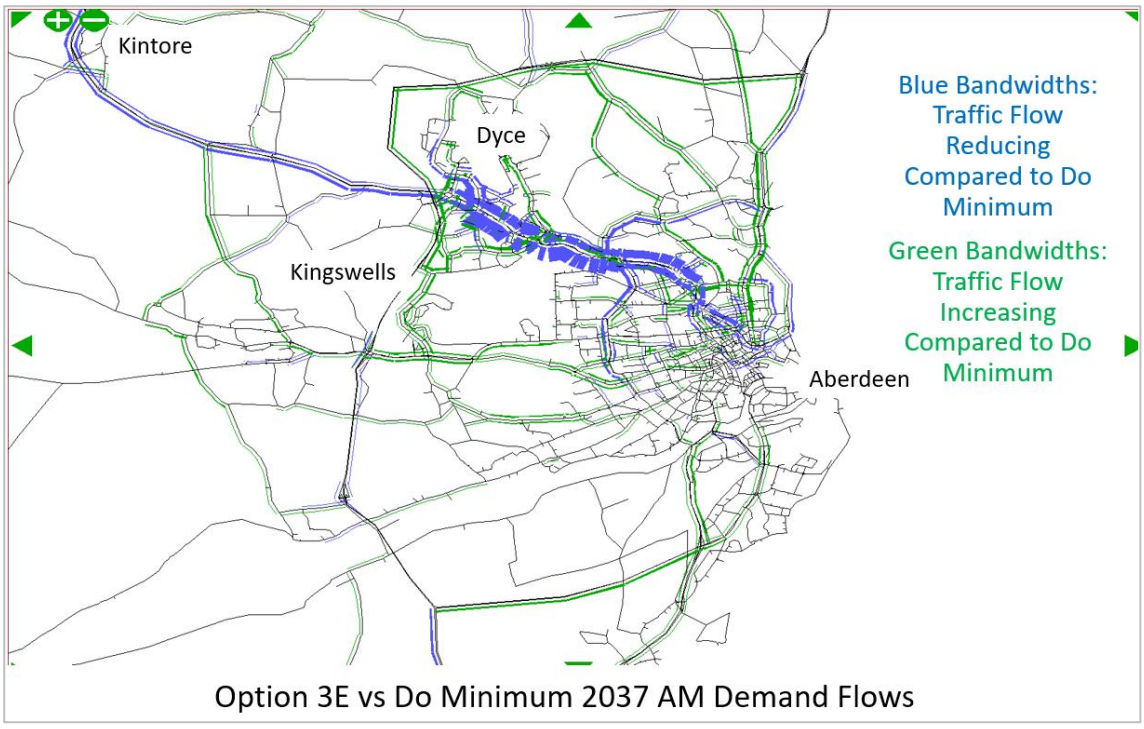


Figure E:4: Option 3E Flow Differences from Do Minimum

E.3.7 Option 3E showed similar strategic re-routing to Options 3B, 3C and 3D. The flow reductions between Kittybrewster and Aberdeen City Centre are smaller than in Option 3D with similar reductions to Options 3B and 3C.

Appendix F Economic Impacts

F.1 Introduction

F.1.1 To provide quantitative analysis to the economy criteria appraisal, the monetised economic impacts of the options have been estimated for both road traffic, public transport and active travel and are presented in this section.

F.1.2 The economic analysis has been undertaken:

- **for road and public transport modes:** using the Departments for Transport's (DfT) TUBA (Transport User Benefit Appraisal) software to generate Travel Economic Efficiency (TEE) benefits and, when combined with scheme costs, to provide an indication of the benefit to cost ratio (BCR) for each option.

- **for active travel modes (cycling):** using the DfT's latest Active Mode Appraisal Toolkit (AMAT), which is a spreadsheet-based tool for estimating the costs and benefits of walking and cycling interventions. In addition, further work has been undertaken to consider the potential travel time savings to cyclists drawing on data from Strava Metro.

F.1.3 It is important to recognise that the quantitative economic impacts presented in this appendix only represent a part of the overall appraisal picture and overly focusing on the BCRs generated by the options as a means of assessing the value of each option is not advised. The schemes to be implemented all consider significant reallocation of road space away from the private vehicle and as such will have a similarly significant journey time disbenefit and associated economic impact on traffic.

F.1.4 The traditional TEE analysis focusses on travel time benefits and, as such, the reallocation of road space is only ever going to create significant disbenefits when measured using this criterion. In addition, the ASAM modelling tool is not particularly sensitive to modal choice, and as such, large improvements in bus journey times do not necessarily translate to large modal shift within the model. The outcome of this is that the modelling results and subsequent economic impacts presented in this chapter likely represent a worst-case scenario in terms of journey times and economic impacts (in reality a greater number of car trips would convert to public transport).

F.1.5 To aid understanding of the economic impacts, while an overall BCR figure is presented for each option encompassing the general traffic and public transport benefits and costs, to highlight the specific benefit to buses, a purely public transport based BCR is also presented, derived using just the public transport benefits and option costs related to the bus priority measures proposed under each option (note that a similar approach is taken for the active travel elements of the study in the AMAT appraisal).

F.2 Travel Time Efficiency (TTE)

F.2.1 Economic appraisal of the road and public transport impacts have been analysed using the Departments for Transport's TUBA (Transport User Benefit Appraisal) version 1.9.17 software with the latest economics file: *Economics_TAG_db_17_0.* This reflects the latest TAG data book from November 2021.

F.2.2 Journey time, trip volume and distance skim matrices from ASAM have been provided for road and public transport. Additional analysis was undertaken to derive reference case distance skim matrices for use within TUBA.

F.2.3 The TUBA inputs for the assessment include a standard TUBA scheme file. The parameters used within the scheme file are presented in the table below. Most of the parameters are the

same between the road and public transport files. Values that differ between road and public transport are shown in separate columns in the table.

Table F.1: TUBA Input Parameters

Parameter	Value Road Scheme File	Value Public Transport Scheme File
TUBA Version	1.9.17	
Economic Parameters	TAG data book version 1.17 (November 2021)	
First Year	2027	
Horizon Year	2086	
Modelled Years	2027 and 2037	
Current Year	2022 (defines the first year in which the discount rate is applied)	
Time Slices	3 time slices (AM, IP & PM)	
Opening Year	2027	
Do Something Costs	As provided in Appendix H	
Unit of account	Factor cost	
GDP Deflator Index	100.00 (costs input in 2010 prices)	
User Classes	7 user classes – Car Employers Business, Car Commute, Car Other, LGV Personal, LGV Freight, OGV1 and OGV2)	3 user classes – public transport (Non-Rail) Business, public transport Commute, public transport Other and Rail Business
LGV and HGV Split Factors	LGV (Other 0.12 and Freight 0.88) *From TAG Data Book – Table A1.3.4* HGV (OGV1 0.2 and OGV2 0.2; includes a 2.5 PCU factor) *Assumed even split between OGV1 & OGV2*	N/A
public transport Business Rail Proportion	N/A	80% rail, 20% bus from analysis of 2027 Do Minimum loaded public transport networks. Time period weighted flows showed 80% of passenger distance was by rail.
Input Matrices	Time (hours), distance (km) and trip matrices	Time (hours), distance (km), fares (£) and trip matrices
Value of Time method	Method 1 – continuous function, based on distance	
Annualisation Factors	AM: 620 IP: 3,700 PM: 620 *Factors from Transport Model for Scotland (TMfS). Values taken for Aberdeen Sub-Area Model (ASAM)*	AM: 530 IP: 2,800 PM: 830 *Factors from Transport Model for Scotland (TMfS). Values taken for Aberdeen Sub-Area Model (ASAM)*
Do Something Scheme Cost Profile	As provided in Appendix H	

F.2.4 TUBA has been run for each intervention level and variant with the road and public transport benefits processed separately. The road economic benefits summarise the travel time benefit, fuel Vehicles Operating Cost (VOC), non-fuel VOC and change in tax revenue. The public transport economic benefits include the travel time benefit, change in operator revenue, and change in tax revenue.

User Benefit Masking

F.2.5 In producing the user benefits for the scheme, and with the ASAM model being a large-scale strategic model, it was necessary to undertake 'masking' of some sector-to-sector movements to exclude potential model 'noise' and help ensure that the monetised impacts reported are reasonably attributed to the options being tested.

F.2.6 The ASAM model is divided into 28 sectors and this sector system was used to determine relevant sector movements for the economic appraisal. The figure below shows the sector system.

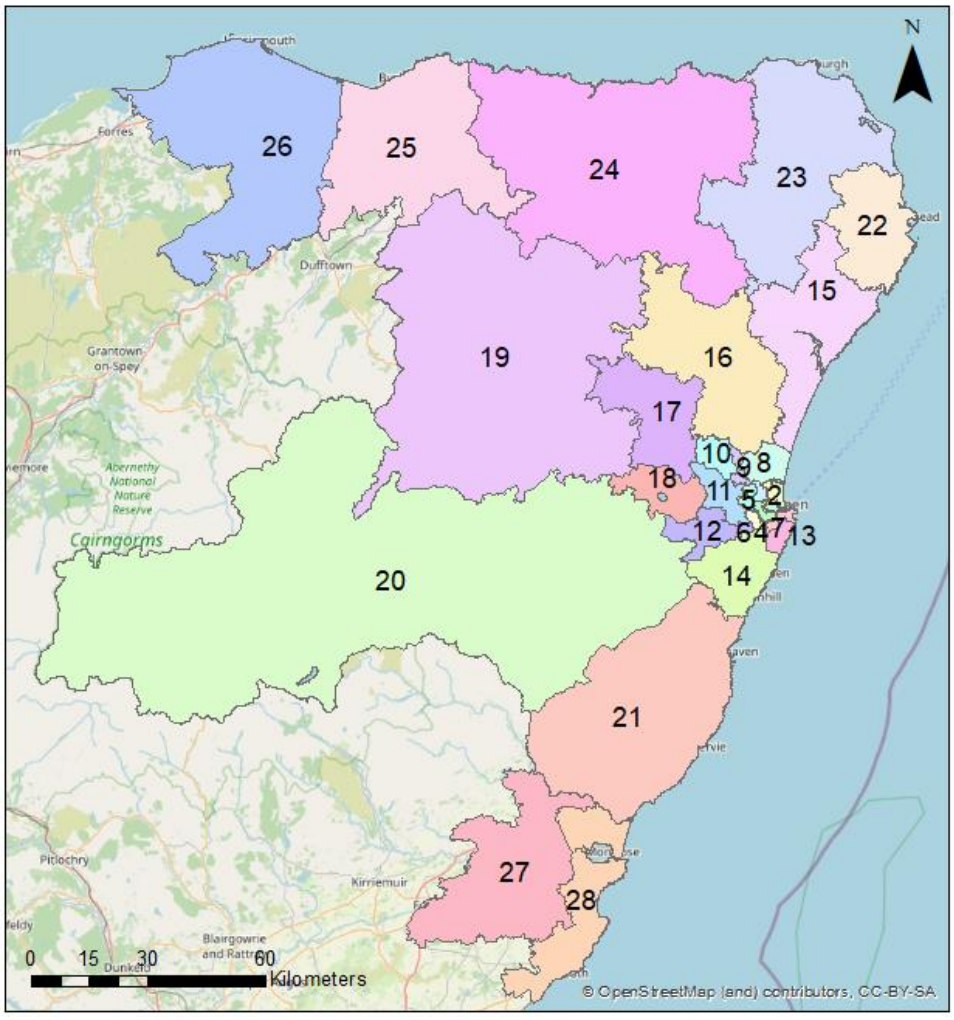


Figure F:1: TUBA Sector System

F.2.7 The 'masking' removed sector pairs that should not be affected by the scheme. This includes movements between sectors that do not use the A96. Roads that may see strategic re-routing as part of the schemes being tested, such as the A92, have been included in the economic analysis. Table F:2 shows which sectors are included within the analysis and which have been 'masked out'.

Table F:2: TUBA Sector Masking

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
8	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
9	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
11	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
12	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	N
13	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	N
14	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	N
15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
16	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
17	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
18	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	N	N	N	Y	Y	N	N	N
19	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	N	N	N
21	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	N	N	N
22	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	N	N	N	N	Y	Y	N
23	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	N	N	N	N	Y	Y	N
24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	N	N	N	N	Y	Y	N
25	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	N	N	N	Y	Y	N
26	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	N	N	N	Y	Y	N
27	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	N	N	N
28	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	N	N	N
29	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Economic Benefits

Road Benefits

F.2.8 The results from the TUBA analysis in term of the economic benefits of the scheme for road are provided in Table F:3

Table F:3: TUBA Road Benefits

Option	Time benefit	Fuel VOC benefit	Non-fuel VOC benefit	Change in indirect tax revenue	Road GHG	Total Benefit Road
Opt1B	-£41.4M	-£2.6M	-£1.0M	£0.6M	-£0.7M	-£44.9M
Opt1C	-£40.3M	-£2.4M	-£0.7M	£0.5M	-£0.6M	-£43.4M
Opt1D	-£51.9M	-£2.7M	-£0.9M	£0.7M	-£0.8M	-£55.6M
Opt1E	-£38.9M	-£2.4M	-£0.7M	£0.5M	-£0.6M	-£42.1M
Opt2B	-£189.0M	-£15.1M	-£7.8M	£4.4M	-£4.7M	-£212.3M
Opt2C	-£196.3M	-£15.6M	-£8.2M	£4.6M	-£5.0M	-£220.4M
Opt2D	-£277.4M	-£20.3M	-£11.7M	£7.1M	-£7.5M	-£309.7M
Opt2E	-£192.5M	-£15.3M	-£8.0M	£4.5M	-£4.8M	-£216.2M
Opt3B	-£216.7M	-£17.0M	-£8.3M	£4.7M	-£5.1M	-£242.5M
Opt3C	-£230.5M	-£17.7M	-£8.8M	£5.0M	-£5.5M	-£257.5M
Opt3D	-£332.7M	-£23.7M	-£13.2M	£8.2M	-£8.7M	-£370.2M
Opt3E	-£228.9M	-£17.7M	-£8.7M	£5.0M	-£5.5M	-£255.8M

F.2.9 As is expected given the significant reallocation of road space to public transport, the table shows significant disbenefits across all options ranging from £42.1M to £370.2M. This is mostly due to the time disbenefit which results from additional congestion and traffic rerouting due to the reduction in road capacity. This leads to disbenefits in vehicle operating costs (increased fuel required to travel further) with a small increase in taxation revenues.

F.2.10 The reduction in road capacity has led to more network congestion leading to increased journey times. This has also resulted in strategic re-routing across the network which will result in longer distance journeys which leads to increased fuel costs. The increase fuel costs have led to an increase in tax revenue. There is also a significant carbon impact associated with the additional fuel costs and time disbenefits, this leads to greenhouse gas disbenefits across the options.

F.2.11 Option 1E shows the smallest disbenefit at £42.1M. Option 1D shows the largest disbenefit of all route variants under intervention level 1 with a total disbenefit of £55.6M.

F.2.12 Intervention level 2 has disbenefits ranging from £212.3M to £309.7M. Options 2B, 2C and 2E show similar results overall. Option 2D was significantly worse than the other route variants of under intervention level 2.

F.2.13 As with intervention level 2, the results for Options 3B, 3C and 3E are similar with disbenefits ranging from £242.5M to £257.5M. Option 3D is by far the worst option for the road appraisal with a total disbenefit of £370.2M.

F.2.14 The results indicate that Options 1D, 2D and 3D have the most significant impacts on network performance compared to the other options. This indicates a high level of congestion and strategic re-routing within the network. Intervention level 1 has the smallest negative impact on the network. Within each option, route variants B, C and E have similar results with less negative impact than route variant D.

Public Transport Benefits

F.2.15 The results from the TUBA analysis for Public Transport are provided in Table F:4. The table shows the total Public Transport benefit, the Present Value of Cost (PVC) associated with the Public Transport scheme and the resulting Benefit-Cost-Ratio (BCR).

Table F:4: TUBA Public Transport Benefits

Option	Total Benefit Public Transport
Opt1B	£23.6M
Opt1C	£32.7M
Opt1D	£26.3M
Opt1E	£30.1M
Opt2B	£73.0M
Opt2C	£93.2M
Opt2D	£84.4M
Opt2E	£86.5M
Opt3B	£77.1M
Opt3C	£95.8M
Opt3D	£90.3M
Opt3E	£95.7M

F.2.16 The table shows significant benefits across all options ranging from £23.6M to £95.8M.

F.2.17 Option 1B shows the smallest overall benefit at £23.6M. Option 1C shows the largest benefit within intervention level 1 with a total benefit of £32.7M.

F.2.18 Intervention level 2 has benefits ranging from £73.0M to £93.2M. Option 2C shows the largest benefit within intervention level 2 while Option 2B shows the smallest benefit.

F.2.19 Intervention level 3 has similar but larger benefits than intervention level 2. The intervention level 3 benefits range from £77.1M to £95.8M. Option 3C shows the largest overall benefit (£95.8M) however Option 3E shows a similar benefit at £95.7M. Options 3B and 3D show smaller benefits at £77.1M and £90.3M respectively.

Road and Public Transport Benefits

F.2.20 The results of the combined road and public transport benefits are provided in Table F.5.

Table F.5 TUBA Road and Public Transport Benefits

Option	Public Transport Benefit	Road Benefit	Total Benefit
Opt1B	£23.6M	-£44.9M	-£21.3M
Opt1C	£32.7M	-£43.4M	-£10.7M
Opt1D	£26.3M	-£55.6M	-£29.3M
Opt1E	£30.1M	-£42.1M	-£11.9M
Opt2B	£73.0M	-£212.3M	-£139.3M
Opt2C	£93.2M	-£220.4M	-£127.2M
Opt2D	£84.4M	-£309.7M	-£225.3M
Opt2E	£86.5M	-£216.2M	-£129.7M
Opt3B	£77.1M	-£242.5M	-£165.4M
Opt3C	£95.8M	-£257.5M	-£161.6M
Opt3D	£90.3M	-£370.2M	-£279.9M
Opt3E	£95.7M	-£255.8M	-£160.0M

F.2.21 The combined road and public transport results show that there are disbenefits across all options ranging from £10.7M to £279.9M.

F.2.22 Intervention level 1 shows the smallest disbenefit compared to the other intervention levels. Options 1C and 1E show total disbenefits of less than £12 Million. Option 1D has the worst result of intervention level 1 with a total disbenefit of £29.3M.

F.2.23 Intervention level 2 shows significantly worse performance than intervention level 1 with disbenefits ranging from £127.2M to £225.3M. Options 2B, 2C and 2E have similar overall results while Option 2D is significantly worse overall.

F.2.24 Intervention level 3 has worse performance than intervention level 2 with total disbenefits ranging from £160.0M to £279.9M. The results for Options 3B, 3C and 3E are similar while Option 3D is by far the worst option overall.

Road and Public Transport Economic Appraisal

F.2.25 The combined road and public transport results have been compared for each option. The combined road and public transport benefits have then been compared against the cost of the public transport schemes to generate a Benefit-Cost Ratio (BCR) value.

F.2.26 A comparison has also been undertaken of the public transport benefits against the scheme costs to understand the BCR values of public transport on its own.

Public Transport Economic Appraisal

F.2.27 Table F.6 the Present Value of Costs (PVC) for each option against the public transport benefits. This has been done to indicate the BCR of the public transport options without the road disbenefits.

F.2.28 Note active travel benefits and costs are not included in these tables but are included in Section F.4.

Table F.6: Public Transport Benefit to Cost Ratios (BCRs)

Option	Total Benefit Public Transport	PVC	BCR
Opt1B	£23.6M	£20.7M	1.14
Opt1C	£32.7M	£32.6M	1.00
Opt1D	£26.3M	£23.4M	1.12
Opt1E	£30.1M	£36.1M	0.83
Opt2B	£73.0M	£37.3M	1.96
Opt2C	£93.2M	£56.6M	1.65
Opt2D	£84.4M	£37.6M	2.24
Opt2E	£86.5M	£60.1M	1.44
Opt3B	£77.1M	£71.3M	1.08
Opt3C	£95.8M	£94.8M	1.01
Opt3D	£90.3M	£79.7M	1.13
Opt3E	£95.7M	£94.6M	1.01

F.2.29 In all options except Option 1E the BCR value is greater than one which shows that the benefits to public transport more than offsets the cost of the options. Option 1E has a BCR value of 0.83 indicating that the benefits to public transport are less than the overall scheme cost. Options 1C, 3B, 3C & 3E all have BCR values between 1 and 1.1 which suggests the overall economic benefit from these options is small.

F.2.30 Option 2D offers the largest BCR at 2.24. It should be noted that all intervention level 2 schemes are better than the other options with BCR values of 1.44 or higher. The next best BCR value outside of intervention level 2 is Option 1B with a BCR of 1.14.

F.2.31 Intervention level 1 BCR values range from 0.83 (Option 1E) to 1.14 (Option 1B). Intervention level 2 BCR values range from 1.44 (Option 2E) to 2.24 (Option 2D). Intervention level 3 BCR values are between 1.01 (Option 3C) and 1.13 (Option 3D).

Road and Public Transport Economic Appraisal

F.2.32 Table F.7 compares the total road and public transport benefits against the costs for each option. This is used to calculate and compare the BCR value for each option.

Table F.7: TUBA Road and Public Transport Benefit to Cost Ratios (BCRs)

Option	Public Transport Benefit	Road Benefit	Total Benefit	PVC	BCR
Opt1B	£23.6M	-£44.9M	-£21.3M	£20.7M	-1.03
Opt1C	£32.7M	-£43.4M	-£10.7M	£32.6M	-0.33
Opt1D	£26.3M	-£55.6M	-£29.3M	£23.4M	-1.25
Opt1E	£30.1M	-£42.1M	-£11.9M	£36.1M	-0.33
Opt2B	£73.0M	-£212.3M	-£139.3M	£37.3M	-3.73
Opt2C	£93.2M	-£220.4M	-£127.2M	£56.6M	-2.25
Opt2D	£84.4M	-£309.7M	-£225.3M	£37.6M	-5.99
Opt2E	£86.5M	-£216.2M	-£129.7M	£60.1M	-2.16
Opt3B	£77.1M	-£242.5M	-£165.4M	£71.3M	-2.32
Opt3C	£95.8M	-£257.5M	-£161.6M	£94.8M	-1.70
Opt3D	£90.3M	-£370.2M	-£279.9M	£79.7M	-3.51
Opt3E	£95.7M	-£255.8M	-£160.0M	£94.6M	-1.69

F.2.33 As the combined road and public transport benefits are negative in all options, the BCR values are also negative. Intervention level 1 offers the best BCR values ranging from -0.33 (Options 1C and 1E) to -1.25 (Option 1D). Intervention level 2 has the worst performance with BCR values between -2.16 (Option 2E) and -5.99 (Option 2D). For intervention level 3, the BCR values range from -1.69 (Option 3E) to -3.51 (Option 3D).

F.3 Monetised Benefits - Cycling

Overview

F.3.1 In order to provide an indication of the potential economic benefit of the proposed active travel interventions proposed under each of the options, two analysis elements have been undertaken:

- An appraisal of the benefits based on the Department for Transport latest (May 2020) Active Mode Appraisal Toolkit (AMAT). This analysis covers benefits relating to Congestion, infrastructure, accidents, local air quality, noise, greenhouse gases, reduced risk of premature death, absenteeism, journey ambience, indirect taxation, and government costs.

- Travel time saving benefits, calculated using the 'rule of half' method described in TAG Unit A1.3 and using values from the TAG Data Book.

F.3.2 Both analysis elements require an estimation of cycling demand, and this is discussed first in this section, followed by the results for each of the above elements.

F.3.3 Although large-scale infrastructure schemes for other modes typically assume a 60-year appraisal period, this is generally not recommended for active modes interventions as they are more likely to have more finite project lives and increased uncertainty around the longevity of their impacts. Therefore, most appraisals of cycling and walking infrastructure schemes assume an appraisal period of 20 years and this approach has been adopted for this appraisal.

Active Travel Demand

F.3.4 All approaches to active mode appraisal require estimation of Do Nothing and Do Something active travel demand and this section describes the method used for the A96 Multi-modal Corridor Study. These demand forecasts are used in the appraisal of benefits of the identified cycling schemes.

Study Area

F.3.5 The study area was defined as those intermediate zones which have population weighted centroids within 1.5km of the proposed infrastructure between Kintore and Dyce and within 1km between Dyce and Mounthooly. As such, the Study Area was identified as those intermediate zones shown in pink in Figure F:2 for variants A, B, C and E. The study area for variant D includes both the pink and blue intermediate zones.

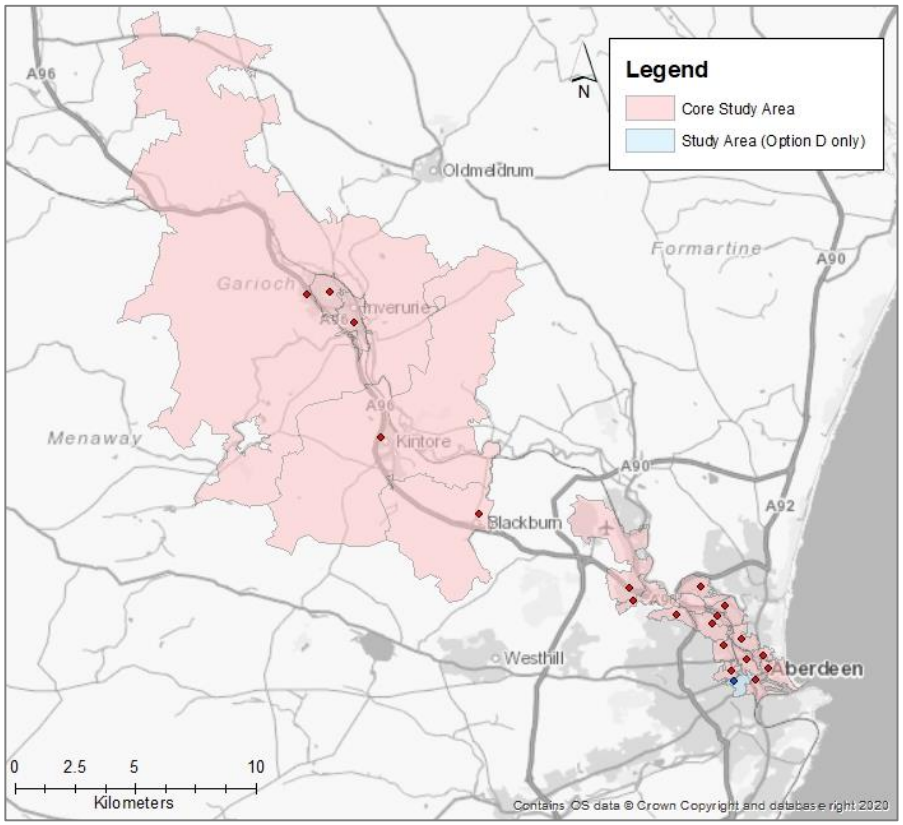


Figure F:2: Active Mode Appraisal Study Area

Baseline Data

F.3.6 Active travel counters in Aberdeen City and Shire are focussed in areas where active travel infrastructure already exists and there is only one counter along the study route. In such a situation TAG Unit A.5.1 suggests that cycle demand can be estimated using Travel to Work Data (TTW) from the 2011 Census. This approach was adopted and is described below.

Travel to Work (2011 Census)

F.3.7 As part of the census, participants were asked where they live, where they work and the main mode of travel they use to travel to work. This dataset is available with origins and destinations described at Intermediate Zone (IZ) level or higher geographies. TTW data was collated for journeys where:

- the residence and workplace fell within the study area;
- the residence and workplace fell within different intermediate zones; and

- STRAVA indicated that the most direct route between IZ centroids would use the A96[21].

F.3.8 This process output estimates of the number of people who cycle to work along the study corridor and could use any new infrastructure as part of their commute.

Baseline Demand for Active Travel

F.3.9 TTW data provides an indication of how many people travel to work between given intermediate zones by bike. However, this is not equivalent to cycle demand as those surveyed will work differing numbers of hours per week and differing days and may not attend work due to sickness or annual leave. As such, we used this data as the basis for estimating underlying cycle commuter demand and then growthed commuting demand up to total cycle demand using factors obtained from the Scottish Household Survey. Specific steps are described below.

Estimating Existing Demand

F.3.10 WebTAG Unit A5.1 requires that active travel demand is expressed in terms of the average number of cycling trips per day. As such, it was necessary to generate an estimate of the proportion of commuters who would be travelling on an average weekday. We estimated that 72% of employees would be working on a given weekday based on the following approach:

i. Identify the proportion of people in employment who work <6 hours, 6-15 hours ,15-30 hours, 31-45 hours, and more than 45 hours per week (Annual Population Survey / Labour Force Survey 2019) and estimate average number of days worked per year for each band.

ii. Estimate the average number of Saturdays and Sundays worked in each band, based on outputs from the Labour Force Survey 2013 (couldn't find equivalent data from 2019, but assume proportions haven't changed significantly).

iii. Estimate the number of days' holiday taken each year for each band, on basis of a full-time employee taking 28 days per year (pro-rated).

iv. Estimate the number of sick leave taken each year for each band, on basis the average worker taking 4.2 days per year (Labour Force Survey 2019).

v. Deduct the above from the average number of weekdays worked per year for each band to estimate the likelihood of an employee working on a given weekday.

F.3.11 We assumed that 72% of employees who commute to work would be working on the average weekday and also that 90% of trips would be a return (per TAG Unite A.5.1), allowing us to generate an estimate of the average number of weekday commuting trips undertaken by bicycle in 2011.

F.3.12 The next step was to consider how cycle travel demand had evolved between 2011 and 2019. There are two key aspects to consider:

- Population change: Data from the Sub-Area population estimates from the National Records of Scotland show that the population of the study area grew by 2% between 2011 and 2019.

- Change in propensity to travel by bike: Scottish Transport Statistics 2020 shows that cycle mode share for commuting trips increased by 14% between 2011 and 2019.

F.3.13 Each of these uplifts was applied to daily 2011 commuter cycle demand estimates to generate the equivalent for 2019.

[21] This is likely to result in an underestimate of demand for new infrastructure as in some cases, the new infrastructure will represent an improvement on the existing route taken between two points, even if it does not provide the most direct route available.

F.3.14 Data from the National Travel Survey (DfT, 2016) indicates that in England 33% of cycling trips are undertaken for commuting purposes (Note: corresponding statistics were sought for Scotland from the Scottish Household Survey but could not be found). Commuter cycle trip numbers were divided by this proportion to estimate total cycle trips in 2019.

Table F:8: Existing Cycle Demand

	B/C/E Variants	D Variants
No. people who travel to work by bicycle between IZs within the study area, where most direct route uses A96 (2011)	159	163
Average weekday commuter cycle trips in 2011	217	222
Average weekday commuter cycle trips in 2019	252	258
Total weekday cycle trips (all purposes) in 2019	**755**	**774**

Forecasting Future Demand

Do-Nothing Case

F.3.15 After estimating demand in 2019, the next step was to consider how demand for cycle infrastructure may evolve in the absence of the proposed scheme. Opening year is assumed to be 2027 and benefits are assumed to be accrued over a 20-year period up to 2047.

F.3.16 TEMPRO was used to generate trip-end growth factors for cycling in Aberdeen City and Shire for the average weekday. Weighted growth factors were calculated based on the study area population which falls into each local authority.

Table F:9: TEMPRO Growth Factors

Area	2019-2027	2027-2047	2019-2047
Aberdeen City	0.9969	1.0101	1.0071
Aberdeenshire	1.0048	1.0189	1.0238
Study Area Weighted Average	**0.9984**	**1.0118**	**1.0102**

F.3.17 The TEMPRO Growth factors showed that cycle demand is likely to grow by 1% between 2019 and 2047. Growth of 1% over 28 years is very low (equivalent to 0.03% growth p.a.) and so it was assumed that cycle demand would remain flat across the whole appraisal period. Note: 2018-based population forecasts from the National Records of Scotland also show very low population growth within the study area, averaging 0.1% p.a. between 2027 and 2043.

Do-Something Case

F.3.18 TAG Unit A5.1 presents three approaches to estimating the demand impact of a new active travel scheme. The decision was taken to use a comparator approach, whereby a similar active travel scheme is identified and observed growth in cycle trips is applied to Do Nothing demand within the study area.

F.3.19 A number of monitoring reports were reviewed for various cycle schemes; however, the Greater Bristol Cycling City scheme was selected due to fact that it involved a programme of infrastructure improvements which focussed on radial and arterial routes into Bristol.

F.3.20 Cycle volumes within the Greater Bristol Cycling City study area grew by 40% following implementation of the scheme. Table F.10 compares Do Nothing and Do Something cycle demand if a similar level of cycle growth was seen in Aberdeen.

Table F.10: Future Cycle Demand

Scenario	B/C/E Variants	D Variants
Do Nothing (2027)	755	774
Do Something (2027)	1058	1084

F.3.21 It is recognised that while the nature of cycle infrastructure improvements proposed in Bristol is similar to that proposed in Aberdeen, the Bristol scheme benefitted from a supporting travel planning scheme. As such, the demand uplift seen in Bristol may be higher than can be achieved in the short-term in Aberdeen. The impact of a lower level of cycle growth have been explored via sensitivity testing.

Summary

F.3.22 Do Nothing active travel demand was calculated from first principles using TTW outputs from the 2011 census and then multiplying these volumes up to total cycle trips using assumptions primarily based on NTS, NRS and SHS data. Observed growth from comparator schemes was then applied to Do Nothing demand forecasts to generate an estimate of how trip making activity may change if proposed options are implemented (i.e., the Do Something case).

F.3.23 These demand forecasts form the basis of the active mode appraisal.

Active Mode Appraisal Toolkit Analysis

F.3.24 In May 2020, the Department for Transport (DfT) published the latest Active Mode Appraisal Toolkit (AMAT), which is a spreadsheet-based tool for estimating the costs and benefits of walking and cycling interventions. This tool was used to calculate and monetise the key costs and benefits of the active travel infrastructure proposed under the A96 Multi-modal Corridor study.

F.3.25 The AMAT spreadsheet quantifies a range of potential benefits including health improvements from increased physical activity, improvements to journey quality and impacts associated with modal shift.

Proposed Options

F.3.26 Improvements to active travel infrastructure have been identified between Kintore and Aberdeen. All options provide new off-road segregated cycle paths between the A96 Tavelty Junction by Kintore and Mounthooly Roundabout, and D variants also provide an additional stretch of segregated cycle path between Kittybrewster and the A944. It is anticipated that new infrastructure will open in 2027.

F.3.27 As the majority of the route has existing pedestrian connections where needed, the Active Mode Appraisal focusses on cycling benefits only, although the costs associated with pedestrian improvements have been included.

User Inputs

F.3.28 The AMAT spreadsheet requires the user to input key pieces of data concerning the proposals and also allows the user to refine underlying assumptions where more locally specific data is available. The table below indicates the assumptions made and how key variables were defined.

Table F.11: AMAT Inputs

AMAT Section	Variable Description	Value	Comment
Intervention Details	Appraisal year	2022	
	Intervention opening year	2027	
	Last year of funding	2027	
	Appraisal period	20 years	
	Local area type	Other Urban	The study corridor passes through 8 NTEM zones. 6 out of 8 zones classed as Other Urban and 2 are Rural. The majority of the population living along the route lives in Other Urban zones.
Mode Information – Cycling	No. trips without proposed intervention	755 (Options B/C/E) 774 (Option D)	
	No. trips with proposed intervention	1084 (Options B/C/E) 1059 (Option D)	
	How much of an average cycling trip will use the intervention?	50%	Assumption from illustrative case study in WebTAG Unit A5.1 (2018)
	Current cycling infrastructure	No provision	On some sections of the study corridor there are existing on-road advisory cycle lanes and also signs indicating that footways are shared use; however, existing provision does not meet current standards.
	Proposed new cycling infrastructure	Off-road segregated cycle track	
	Are any additional shower facilities being added?	No	
	Are any additional secure storage facilities being added?	No	
Assumptions (where changed from default)	Average length of trip	4.8km	Transport and Travel in Scotland 2019 (SHS Travel Diary TD5)
	Proportion otherwise using a car	12.5%	Values from TAG Databook Table A5.4.7 normalised per AMAT Guidance (as no light rail on study corridor)
	Proportion otherwise using a taxi	9.1%	
	Background growth rate in trips	0.0%	TEMPRO Cycle Growth Factors and NRS Population Growth Forecasts.

Costs

F.3.29 Costs have been developed for the delivery of all options. While variants B, C and E are essentially the same in terms of the active travel infrastructure proposed, costs vary by intervention level as

the nature of bus priority infrastructure determines the amount of land take needed to accommodate active travel infrastructure.

F.3.30 As such, costs to deliver B/C/E variants range from £17.3m to £26.2m (median cost corresponds with Option 2C) and those for D variants range from £18.4m to £26.0m.

Table F.12: Pedestrian + Cycle Infrastructure Costs (£) (2021 prices, excluding Optimism Bias)

Intervention Level	Variant B	Variant C	Variant D	Variant E
1 (Standard Bus Lanes)	£17.3m	£17.2m	£18.3m	£17.9m
2 (Enhanced Bus Lane)	£20.6m	£22.3m	£20.9m	£22.7m
3 (Busway)	£25.5m	£26.2m	£25.9m	£26.2m

F.3.31 Costs were also generated for the maintenance of active travel infrastructure. It was assumed that maintenance would cost £3,000 per km of cycle infrastructure per annum. This is roughly equivalent to the cost of cycle track replacement every 30 years.

F.3.32 An optimism bias of 44% was applied to all costs, given the early phase of scheme development.

AMAT Results

F.3.33 The results for the active mode appraisal are provided in Table F.13, Table F. and Table F.15.

F.3.34 BCRs are highest for intervention level 1 variants, given that there are additional costs associated with delivering active travel infrastructure alongside higher levels of bus priority infrastructure, but no additional active travel benefits.

F.3.35 All D variants yield slightly higher benefits than B/C/E variants, given that D variants include an additional stretch of infrastructure between Berryden and the A944.

Table F.13: AMAT Results Summary – Option 1 Variants

Factor	Value (£000s)			
	Option 1B	Option 1C	Option 1D	Option 1E
Congestion benefit	0.30	0.30	0.30	0.30
Infrastructure maintenance	0.47	0.47	0.48	0.47
Accident	14.52	14.52	14.88	14.52
Local air quality	1.89	1.89	1.94	1.89
Noise	0.97	0.97	0.99	0.97
Greenhouse gases	5.91	5.91	6.06	5.91
Reduced risk of premature death	1,513.55	1,513.55	1,551.62	1,513.55
Absenteeism	184.26	184.26	188.89	184.26
Journey ambience	1,734.60	1,734.60	1,778.24	1,734.60
Indirect taxation	-6.62	-6.62	-6.79	-6.62
Government costs	14,151.69	14,151.69	15,038.56	14,691.30
Present Value of Benefits (PVB)	3,449.38	3,449.38	3,536.14	3,449.38
Present Value of Costs (PVC)	14,151.22	14,151.22	15,038.08	14,690.83
BCR	0.24	0.24	0.24	0.23

F.3.36 Intervention level 1 BCRs are very similar across the variants, ranging from 0.23 to 0.24. Although Option 1D yields slightly higher benefits, it is also slightly most expensive than Option 1B, 1C and 1E.

Table F.14: AMAT Results Summary – Option 2 Variants

Factor	Value (£000s)			
	Option 2B	Option 2C	Option 2D	Option 2E
Congestion benefit	0.30	0.30	0.30	0.30
Infrastructure maintenance	0.47	0.47	0.48	0.47
Accident	14.52	14.52	14.88	14.52
Local air quality	1.89	1.89	1.94	1.89
Noise	0.97	0.97	0.99	0.97
Greenhouse gases	5.91	5.91	6.06	5.91
Reduced risk of premature death	1,513.55	1,513.55	1,551.62	1,513.55
Absenteeism	184.26	184.26	188.89	184.26
Journey ambience	1,734.60	1,734.60	1,778.24	1,734.60
Indirect taxation	-6.62	-6.62	-6.79	-6.62
Government costs	16,805.25	18,119.20	17,037.85	18,459.15
Present Value of Benefits (PVB)	3,449.38	3,449.38	3,536.14	3,449.38
Present Value of Costs (PVC)	16,804.78	18,118.72	17,037.36	18,458.68
BCR	0.21	0.19	0.21	0.19

F.3.37 Intervention level 2 BCRs range from 0.19 to 0.21. Options 2B and 2D offer the highest BCRs on the basis that Option 2B is the cheapest and Option 2D brings greatest value of benefits.

Table F.15: AMAT Results Summary – Option 3 Variants

Factor	Value (£000s)			
	Option 3B	Option 3C	Option 3D	Option 3E
Congestion benefit	0.30	0.30	0.30	0.30
Infrastructure maintenance	0.47	0.47	0.48	0.47
Accident	14.52	14.52	14.88	14.52
Local air quality	1.89	1.89	1.94	1.89
Noise	0.97	0.97	0.99	0.97
Greenhouse gases	5.91	5.91	6.06	5.91
Reduced risk of premature death	1,513.55	1,513.55	1,551.62	1,513.55
Absenteeism	184.26	184.26	188.89	184.26
Journey ambience	1,734.60	1,734.60	1,778.24	1,734.60
Indirect taxation	-6.62	-6.62	-6.79	-6.62
Government costs	20,624.32	21,158.08	20,969.33	21,158.08

Factor	Value (£000s)			
	Option 3B	Option 3C	Option 3D	Option 3E
Present Value of Benefits (PVB)	3,449.38	3,449.38	3,536.14	3,449.38
Present Value of Costs (PVC)	20,623.85	21,157.61	20,968.85	21,157.61
BCR	0.17	0.16	0.17	0.16

F.3.38 Intervention level 3 BCRs range from 0.16 to 0.17. Again, B and D variants offer the highest BCRs as Option 3B is the cheapest and Option 3D brings greatest benefits.

Sensitivity Testing

F.3.39 Given the very limited amount of existing cycle count information and high-level nature of proposals, there is inherent uncertainty in appraisal outputs. Sensitivity testing was undertaken to allow exploration of how changes in key variables would affect the value for money provided by the proposed interventions.

F.3.40 As the active travel infrastructure under variants B/C/E and D are so similar in terms of both the proposed cycle infrastructure and active mode appraisal results, sensitivity testing was only completed for B/C/E variants. Costs were applied for Option 2C as it reflects the median cost of the B/C/E variants.

F.3.41 Table F.16 summarises the sensitivity tests undertaken.

Table F.16: Sensitivity Tests Defined

Sensitivity Test	Adjusted Variable
S1 – Level of change (Low)	20% uplift in cycling demand due to intervention
S2 – Length of appraisal period (Low)	10-year appraisal period
S3 – Length of appraisal period (High)	30-year appraisal period
S4 – % of average cycle trip using intervention (High)	100% of cycle trip uses intervention
S5 – % of average cycle trip using intervention (Low)	25% of cycle trip uses intervention
S6 – Background growth in trips (High)	0.75% background growth in cycle trips
S7 – Proportion in employment (Low)	28.2% of cyclists in employment

F.3.42 Table F.17 provides the resulting BCRs for the above sensitivity tests on Option 2C.

Table F.17: Sensitivity Test Results (Option 2C)

Sensitivity Test	Benefit Cost Ratio
S1 – Level of change (Low)	0.14
S2 – Length of appraisal period (Low)	0.10
S3 – Length of appraisal period (High)	0.27
S4 – % of average cycle trip using intervention (High)	0.29
S5 – % of average cycle trip using intervention (Low)	0.14
S6 – Background growth in trips (High)	0.20

Sensitivity Test	Benefit Cost Ratio
S7 – Proportion in employment (Low)	0.19

F.3.43 Sensitivity testing shows that changes to the appraisal period/assumed project lifetime generate the biggest impacts upon the BCR. A shorter appraisal period / intervention lifespan of 10 years is considered inappropriate for a project like this, given that new cycle infrastructure will form part of larger scale road infrastructure improvements. As such, it is suggested that shortening the appraisal period is unrealistic and associated BCR should be discarded.

F.3.44 The variable which generates the next biggest impact on BCRs is the proportion of an average trip which will use the new infrastructure. The AMAT Toolkit suggests that this could be calculated by dividing the length of the scheme by the length of an average cycling trip based on data from the National Travel Survey. Given that proposed infrastructure will exceed the length of an average cycle trip, this variable could have been set at 100% in the core scenario, but a more conservative and defensible approach was taken given the variety of origins and destinations in a city environment.

Active Travel – Travel Time Savings Analysis

F.3.45 A review of Strava Metro data for origins and destinations along the study corridor shows that the most popular cycle route is frequently not the most direct route. As the A96 is currently a heavily trafficked route with limited protection for cyclists, the provision of an off-road segregated cycle path may permit cyclist to use a more direct route and so make travel time savings.

F.3.46 Travel time saving benefits were calculated using the 'rule of half' method described in TAG Unit A1.3 and using values from the TAG Data Book. The approach taken is further described below:

- Strava was used to find the most popular and most direct cycle routes between intermediate zones within the study area[22].
- This permitted calculation of a travel distance saving, which was converted to a time saving based on the assumption that a cyclist would travel at an average of 15kph (National Travel Survey 2016).
- It was found that the average cyclist could make a time saving of approximately 2.46 minutes under B/C/E variants and 2.47 minutes under D variants.
- The rule-of-half was applied and it was assumed that only half the cyclists would accrue this time saving.
- These travel time savings were valued using the TAG Data Book and found to have a Net Present Value of **£30,387**. Given that time savings under variants B/C/E and D are so similar, the value of travel time saving benefits is assumed to be the same for all options.

Summary

F.3.47 B, C, D and E variants are estimated to generate approximately £3.45m and £3.54m of active travel benefits respectively (PVB). D variants yield slightly higher benefits than B/C/E variants, given that D variants include an additional stretch of infrastructure between Berryden and the A944. Note: It is estimated that users of the new infrastructure will also generate approximately £30,000 of travel time savings benefits, but these have been excluded from the main BCR calculation as they are not part of the DfT's Active Mode Appraisal Toolkit approach.

[22] Completed for zone pairs where the 2011 census indicated that TTW cycle trips were being made and where the most direct route involves use of the A96.

F.3.48 Costs were developed for the delivery and maintenance of all options and are estimated to vary from £14.2m to £21.2m (PVC). While variants B, C and E are essentially the same in terms of the active travel infrastructure proposed, costs vary by intervention level as the nature of bus priority infrastructure determines the amount of land take needed to accommodate active travel infrastructure.

F.3.49 BCRs are highest for intervention level 1 variants, given that there are additional costs associated with delivering active travel infrastructure alongside higher levels of bus priority infrastructure, but no additional active travel benefits.

F.3.50 Sensitivity testing was undertaken to identify the impact of changing key variables. A BCR range of 0.10 to 0.29 was calculated based on making changes to core Option 2C. The lowest BCR of 0.10 resulted from changing the assumption on the intervention lifetime/appraisal period to 10 years and the highest BCR resulted from an assumption that 100% of cycle trip length would occur on the corridor. Both are extreme assumptions for the options considered but demonstrate how the value of benefits could vary.

Appendix G Hansen Analysis

G.1 Introduction

G.1.1 Hansen indicators provide a measure of accessibility from a specific origin to all destinations in a study area, weighted by chosen criteria. High scores indicate good accessibility, and low scores suggest there is poor accessibility according to the chosen criteria.

G.1.2 Two key accessibility indicators have been considered to provide an indication of the **accessibility change** with the options in place, compared to the reference case situation.

- Hansen Indicator for **Change in Accessibility to Employment** by **public transport**: the change in how accessible the area is in terms of accessing employment between the reference case and each 'Do Something' option scenario. In this instance the change in the **public transport** journey time between each pair of origins/destinations is weighted by the number of jobs at the destination zones as the 'criteria'. The results for each origin – destination pair are then summed over all origin zones and the global change in employment accessibility (as a percentage) between the Do Reference and option can then be calculated.

- Hansen Indicator for **Change in Accessibility to Employment** by **private vehicle:** as above but using car travel times between origin-destination pairs instead of public transport travel times.

G.2 Hansen Indicator Calculation - Methodology

G.2.1 The travel time data for both the car and public transport travel times between origin-destination pairs has been taken from the Aberdeen Sub Area Model 14 (ASAM14), the most up to date available strategic transport model available at the time of the analysis.

G.2.2 For the Hansen calculations, origin-destination journey times have been taken from a single road and public transport user class from within ASAM14. The car journey times have been taken from the *Car Commute* user class. The public transport journey times have been taken from the public transport *Non-Work Commute* user class.

G.2.3 ASAM contains a reference case and two future years: 2027 and 2037. The Hansen analysis has been undertaken for both these future years. Pure travel times have been used for both car and public transport in the analysis e.g., generalised journey times, which include additional allowance for fares etc. have not been used.

G.2.4 The Hansen calculation, as described above for the change in accessibility to employment, requires the number of jobs at each defined ASAM destination zone. Jobs data have been acquired from the latest available Business Register and Employment Survey (BRES) data. However, the geographic coverage of BRES data zones does not exactly match the coverage of the ASAM zone plan. As such, a process has been undertaken in GIS software to best match the BRES data zones to ASAM model zones. Where many BRES zones were within an ASAM zone, the jobs for each BRES zone have been summed to give the total jobs in the ASAM zone. In some cases, a BRES zone spanned multiple ASAM zones. In such cases, the number of ASAM zones within the BRES zone is determined and each ASAM zone has then allocated an equal share of the jobs in the BRES zone. The output of this process is a number of jobs assigned to each ASAM zone.

G.2.5 The Hansen calculation considers the 'deterrent' effect of travel time by means of a negative exponential function which is hypothesised to describe the relationship between travel duration and the likelihood of travel.

G.2.6 The Hansen value for each origin-destination pair has been calculated using the following formula:

$$Hansen_{ij} = E_j * e^{-\lambda t_{ij}}$$

Where:

- E is the number of jobs (employment) at the destination zone j
- t is the journey time (either by car or public transport depend on the indicator being calculated) in minutes between the origin (i) and destination (j) pair
- λ is the deterrent coefficient factor. For this analysis λ has been set as 0.035 for cars and 0.044 for public transport[23].

G.2.7 The Hansen values are calculated for each origin-destination pair, before being summed across all origin destination pairs. Note that in actuality, the Hansen values have only been considered for certain zones from the ASAM model that are likely to see journey time changes as a result of the proposals. This is due to the size of the strategic model and to reduce background model 'noise'.

G.2.8 Finally, the change in accessibility is calculated as:

$$Change\ in\ Accessibility_s = \frac{\sum Hansen^s{}_{ij}}{\sum Hansen^r{}_{ij}}$$

Where:

- s is scenario (option)
- r is the reference case

G.3 Hansen Accessibility Analysis Results

G.3.1 The outcome of the Hansen analysis for each of the modelled ASAM periods (AM, IP, and PM) is shown in Table G:1.

Table G:1: Hansen Accessibility Analysis Results

Time Period	Option	% change in accessibility			
		2027		2037	
		Car	Public Transport	Car	Public Transport
AM	1B	-0.3%	1.5%	-0.4%	1.9%
	1C	-0.4%	1.7%	-0.5%	2.4%
	1D	-0.5%	1.5%	-0.5%	1.9%
	1E	-0.4%	1.8%	-0.5%	2.3%
	2B	-0.9%	2.4%	-0.9%	3.2%
	2C	-0.9%	3.6%	-1.0%	4.4%
	2D	-1.2%	3.4%	-1.4%	4.1%
	2E	-0.9%	3.2%	-0.9%	4.0%
	3B	-1.0%	2.9%	-1.1%	3.4%

23 https://webarchive.nationalarchives.gov.uk/ukgwa/+/http:/www.dft.gov.uk/pgr/regional/ltp/accessibility/guidance/gap/technicalappendix6informatio3639

Time Period	Option	% change in accessibility			
		2027		2037	
		Car	Public Transport	Car	Public Transport
	3C	-1.0%	3.8%	-1.3%	4.2%
	3D	-1.5%	3.7%	-1.7%	4.2%
	3E	-1.1%	3.4%	-1.2%	4.6%
IP	1B	0.0%	0.3%	0.0%	-0.1%
	1C	0.0%	0.3%	0.0%	-0.2%
	1D	0.0%	0.4%	0.0%	-0.1%
	1E	0.0%	0.1%	0.0%	-0.2%
	2B	-0.6%	2.4%	-0.7%	2.3%
	2C	-0.5%	3.1%	-0.8%	2.8%
	2D	-0.8%	3.3%	-1.0%	3.0%
	2E	-0.5%	2.7%	-0.7%	2.6%
	3B	-0.6%	2.6%	-0.8%	2.3%
	3C	-0.6%	3.3%	-0.8%	3.0%
	3D	-0.9%	3.6%	-1.1%	3.2%
	3E	-0.6%	3.2%	-0.8%	2.9%
PM	1B	-0.2%	1.4%	-0.6%	1.6%
	1C	-0.3%	2.4%	-0.5%	2.3%
	1D	-0.4%	1.6%	-0.6%	1.3%
	1E	-0.2%	2.0%	-0.3%	2.1%
	2B	-0.8%	2.5%	-0.9%	3.2%
	2C	-0.9%	3.8%	-0.9%	4.1%
	2D	-1.1%	3.4%	-1.3%	2.6%
	2E	-0.8%	3.1%	-1.0%	3.7%
	3B	-1.0%	2.8%	-1.1%	3.1%
	3C	-1.1%	3.7%	-1.1%	4.1%
	3D	-1.3%	3.3%	-1.7%	2.3%
	3E	-1.0%	3.9%	-1.2%	3.9%

G.3.2 The table shows:

- In all options the car accessibility has reduced while the public transport accessibility has increased.
- The interpeak shows smaller accessibility changes than the AM or PM peaks.
- The results are similar between 2027 and 2037 however the public transport accessibility benefits are larger – as are the car disbenefits.
- Option 3D shows the greatest reduction in car accessibility with a reduction of 1.7% in both the AM peaks in 2037.

- Option 3E shows the greatest increase in public transport accessibility with a 4.6% increase in the AM peak in 2037. Option 2C shows a 4.4% increase in public transport accessibility in the AM peak with a 4.1% increase in the PM peak.

- Intervention Level 1 shows the smallest accessibility disbenefits to car and the smallest accessibility benefits to public transport overall.

- Intervention Levels 2 and 3 have similar results overall however Options 2B and 3B have smaller accessibility impacts than the other options.

Appendix H Option Affordability

H.1 Introduction

H.1.1 This appendix sets out the assumptions used to estimate the cost of road schemes developed at the concept design stage the study. The cost estimates provided here are based on either an approximate rate or item cost for typical types of road infrastructure proposed to support active travel measure and the three levels of intervention for bus priority along the corridor.

H.1.2 The information described in this appendix should be read in conjunction with the Option Development Report, *A96 Multi-modal Transport Study - Option Development Report, Stantec, April 2022,* which includes concept sketches and concept designs of all proposals summarised below (and as summarised in this report).

H.2 Proposals

H.2.1 Proposals for the corridor were developed to meet the Transport Planning Objectives for the study and can be summarised as:

- **Section I (Inverurie to Craibstone roundabout)**: A shared-use path adjacent to the eastbound dual carriageway of the A96 requiring either an upgrade to an existing path (Inverurie to Kintore) or the introduction of a new path (Kintore to Craibstone). Other than the introduction of a dedicated left turn slip road at the Inverurie roundabout junction (Elphinstone Road to A96 eastbound) and bus stop improvements, no other infrastructure to support buses is proposed due to services not experiencing significant delay along this section of the corridor.

- **Section II (Craibstone roundabout to Printfield Walk)**: Either a two-way segregated cycle track, adjacent to the eastbound dual carriageway (or with-flow segregated cycle tracks on each side of the road) plus one of three levels of bus priority intervention (see below) is proposed.

- **Section III (Printfield Walk to Calsayseat Road)**: Either a two-way segregated cycle track, adjacent to the eastbound single carriageway (or with-flow segregated cycle tracks/ lanes on each side of the road) plus one of three levels of bus priority intervention (see below) is proposed.

- **Section IV (Calsayseat Road to Mounthooly roundabout)**: Either a two-way segregated cycle track adjacent to the eastbound dual carriageway (or with-flow segregated cycle tracks/ lanes on each side of the road) plus one of either three levels of bus priority intervention (see below) is proposed.

H.2.2 Due to the impact of the proposed Berryden Corridor Improvement Plan (BCIP), Section III has four variants:

- **Variant A**: Assumes no BCIP. This option was discounted by Aberdeen City Council.

- **Variant B**: Between Kittybrewster roundabout and Clifton Road, bus priority interventions (Levels 1, 2 and 3) are proposed along the section of the BCIP, while active travel measures are proposed along the old alignment of the A96 (Great Northern Road). No changes are made to Section III between Clifton Road and George Street.

- **Variant C**: As Option B but with road widening between Clifton Road and George Street which requires the replacement of the Belmont Road railway bridge. This road widening allows the active travel measures and bus priority interventions (Levels 1, 2 and 3) to be introduced between Clifton Road and George Street.

- **Variant D**: As Option B but avoids the road widening between Clifton Road and George Street (as described in Option C) by directing the active travel measures and bus priority interventions (Levels 1, 2 and 3) towards the city centre via the BCIP between Clifton Road and Denburn Road.

- **Variant E**: Avoids the BCIP completely by introducing active travel and bus priority measures along the existing section of the A96 (Great Northern Road) between Kittybrewster roundabout and Clifton Road. Beyond the new BCIP junction at Clifton Road, active travel measures and bus priority interventions (Levels 1, 2, 3) are those described in Option C which includes the replacement of the Belmont Road railway bridge.

H.3 Bus Priority Intervention Levels

H.3.1 The intervention levels for bus priority can be summarised as:

- **Level 1 ('Standard' bus lanes**): Bus lanes set back from junctions to maintain junction capacity.

- **Level 2 ('Enhanced bus lanes):** Bus lanes that extend up to junction stop lines and so require modification to the junction layout and the method of signal control.

- **Level 3 (Busway):** A dedicated 2-way roadway for the exclusive use of local bus services and requiring modification to the adjacent road and to junctions.

H.4 Typical Types of Road Infrastructure

H.4.1 The typical types of road infrastructure to deliver the active travel measures and bus priority interventions (Levels 1, 2 and 3) are described in the table below. This table also includes some of the assumptions used when estimating a cost for either a rate or item.

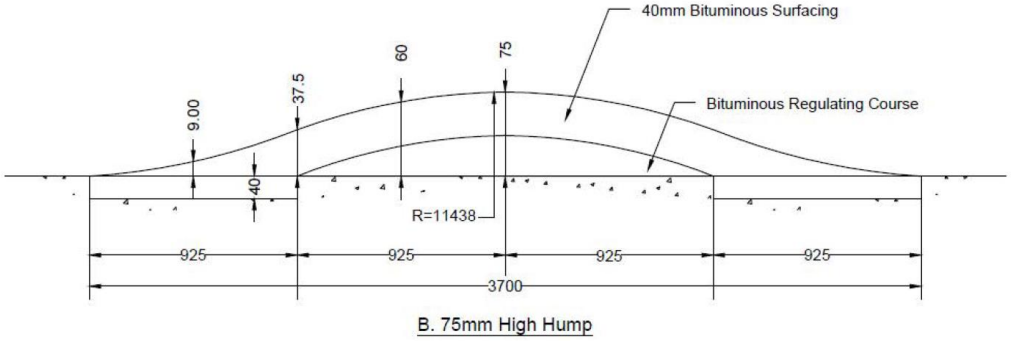
Table H:1: Cost Rates and Units for Typical Types of Road Infrastructure

Main Junctions		Cost (£)	Information
Main road junction modification (minor works)	no.	£750,000	Modification to some kerb lines and new traffic signals at a major junction. Incorporates a two-way cycle track across one arm within the method of signal control.
Main road junction modification (intermediate works)	no.	£3,500,000	Modification to all kerb lines, road widening and new traffic signals at a major junction. Incorporates a two-way cycle track across one arm within the method of signal control.
Main road junction modification/ replacement (major works)	no.	£7,500,000	Complete change to the layout of the junction and the traffic signal control, including the conversion of roundabouts to signal controlled crossroads. Likely to require road widening. Incorporates a two-way cycle track across one arm within the method of signal control.
Bus Infrastructure		**Cost (£)**	**Information**
Bus lane (standard) @ 3.25m wide *Assumptions* • *Road resurfacing = £37/m^2 x 3.25m=£122/m* • *Road markings and Signage = £20/m*	/m	£145	A new 3.25 metre wide bus lane created within the nearside lane of an existing multi-lane road carriageway. The works would include resurfacing in red SMA, all signage and road markings for the bus lane and adjacent traffic lane. 
Bus lane (enhanced) @ 3.5m wide *Assumptions* • *Road resurfacing = £37/m^2 x 3.5m = £130/m* • *Road markings and Signage = £20/m*	/m	£155	As above but for a bus lane with a width of 3.5 metres

Bus Infrastructure (continued)		Cost (£)	Information
Bus lane (busway) @ 7.3m wide *Assumptions* • *Road resurfacing = £37/m^2 x 7.3m=£260/m* • *Road markings and Signage = £20/m* • *Kerbing = £50/m* • *Drainage = £135/m* • *Plus works to the other side of the road = £35/m*	/m	£500	The introduction of a busway on one side of a dual carriageway and conversion of the adjacent carriageway to two-way general traffic. The busway would be resurfaced in red SMA with appropriate busway signage and road markings. A new kerbed central reservation would be created, and all road markings replaced to create a two-way general traffic road. The drainage rate assumes every 100m there are 10 gullies at £500 each (including 2.5 metre drainage runs to reconnect) and 1 manhole cover at £3,500 each. 
Bus stop & shelter ('standard' bus lane option)	no.	£7,500	High quality standard bus shelter with kerb works and road markings to meet bus stop accessibility standards.
Bus stop & shelter ('enhanced' bus lane option)	no.	£15,000	High quality partially enclosed bus shelter with kerb works and road markings to meet bus stop accessibility standards.
Bus stop & shelter (busway option)	no.	£30,000	Highest quality bus shelter with tram levels of provision, functionality, and accessibility.

Bus Infrastructure (continued)		Cost (£)	Information
Bus stop layby removal	no.	£7,500	The removal of a typical bus stop layby with new kerbs, Pre-Cast Concrete (PCC) paving and drainage/ gully modifications. Total area approx. 100m^2. 
Bus gate / pre-signal	no.	£500,000	Traffic signal infrastructure, CCTV cameras for enforcement, signage, and wider traffic management measures to create a bus only road (with local access) or a gating point for general traffic.
Cycle Infrastructure		**Cost (£)**	**Information**
Cycle track (2-way) @ 3m wide (full depth construction) *Assumptions* • *Footway construction = £90/m^2 x 3.0m = £270/m* • *New kerb line = £50/m* • *Road markings and Signage = £10/m* • *Modified drainage = £30/m*	/m	£360	The construction of a new asphalt surfaced 3.0 metre wide cycle track with kerbed edge on one side, drainage, and all cycle track markings and regulatory signage.
Cycle track buffer zone to road @ 2.0m wide *Assumptions* • *Footway resurfacing = £37/m^2 x 2/m = 74/m* • *New kerb line = £50/m*	/m	£125	The construction of a 2.0 metre kerbed, asphalt surfaced buffer zone between the cycle track and road carriageway with one kerbed edge. Generally, this would be located on existing footway so only resurfacing and not full depth construction would be needed. No drainage cost required as surface water would drain either onto the road or the cycle track where gullies will be provided.

Cycle Infrastructure (continued)		Cost (£)	Information
Side road junction modification to accommodate cycle track	no.	£12,500	This would have the cycle track running straight across the mouth of the junction or off-set away from the main road (see photograph). In addition to kerb works to reduce corner radii it would include a raised table, road markings and signage. 
Cycle lane (light segregated) @ 2.0m wide	/m	£75	A cycle lane with light segregation (using armadillo or orca separators plus wands). Would include all road markings (including diag. 1057 cycle logos) and regulatory signage along the cycle lane. 

Cycle Infrastructure (continued)		Cost (£)	Information
Cycling on-road (within a traffic calmed street) *Assumptions* • *Sinusoidal speed hump every 100 metres = £7,500* • *Signage and road markings = £10/m*	/m	£85	Road markings (including diag. 1057 cycle logos) and directional signage only. Includes a sinusoidal speed hump every 100 metres but exclude filtered permeability features to remove through traffic.  B. 75mm High Hump *Sinusoidal Ramps (Hump may be round or fat-top) taken from LTN 1/20*
Share use path @ 3.0m wide plus 2.0m buffer (Upgrade to existing shared use path) • *Assumptions* • *Footway construction = £90/m² x 1m = 90/m* • *Resurfacing = £37/m² x 1m = 111/m* • *New kerbs = £50/m*	/m	£180	The widening of an existing path (asphalt surfaced) from 2 to 3 metres requiring a 1.0 metre width of full depth path construction. There would also be a kerbed 2 metre wide buffer between the path and the road. The buffer area would be planted/ grassed and not hard surfaced.
Shared use path @ 3.5m wide (full depth construction/ asphalt surfaced) • *Assumptions* • *Construction = £90/m² x 3.5m = £315/m* • *Buffer = £10/m² x 2.0m = £20/m* • *Signing = £5/m*	/m	£340	A new 3.5 metre wide shared use path (asphalt surfaced) plus 2.0m wide buffer between the path and the road. The buffer area would be planted/ grassed and not hard surfaced.
Highway protection barriers	/m	£50	Armco barriers or similar.
Cycle path lighting (low level)	/m	£50	Low level lighting columns and ducting for power - installed every 25 metres.

Pedestrian Infrastructure		Cost (£)	Information
Footway resurfacing (flags/ slabs) @ 3.0m wide *Assumptions* • *Resurfacing (sub-base + paving) = £40/m² x 3.0m = £120/m*	/m	£120	Resurfacing of an existing footway with Pre-Cast Concrete paving slabs. 
Footway resurfacing (asphalt) @ 3.0m wide *Assumptions* • *Resurfacing (sub-base + surfacing) = £45/m² x 3.0m = £135/m*	/m	£135	Resurfacing of an existing footway using asphalt.
Footway @ 3.0m wide (full depth construction asphalt surfaced) *Assumptions* *Construction (sub-base + surfacing) = £90/m² x 3.0m = £270/m*	/m	£270	The construction of a new footway with asphalt surface plus edging. Assumes existing kerbs are retained with no replacement or repair required.

Pedestrian Infrastructure (continued)		Cost (£)	Information
Pedestrian/ cycle crossing (uncontrolled)	no.	£2,500	New or upgraded uncontrolled crossing with dropped kerbs and tactile paving on each side of the road. 
Pedestrian crossing (PedEx)	no.	£75,000	A new signal controlled pedestrian crossing on a main road.
Pedestrian crossing (conversion to Toucan)	no.	£25,000	The conversion of an existing signalised crossing on a main road to Toucan/ Parallel control.
Pedestrian crossing (Toucan/ Parallel)	no.	£75,000	A new signal controlled shared use crossing on a main road.
Side road junction modification (corner radii)	no.	£5,000	Reduction to the corner radii of an existing junction between 1 to 3 metres depending on the width of the side road.
Side road junction modification (entry treatment)	no.	£12,500	A reduction to the corner radii of an existing junction (as above) plus a tabletop entry treatment.

Pedestrian Infrastructure (continued)		Cost (£)	Information
Side road junction modification (continuous footway)	no.	£20,000	A reduction to the corner radii (as above) of an existing junction plus a continuous footway treatment. 
Other Infrastructure (to support active travel)		**Cost (£)**	**Information**
Road construction at 1m wide (full road construction) *Assumptions* *Construction = £350/m^2 x 1.0m = £350/m*	/m	£350	A widening of the road carriageway into the central reservation by 1 metre requiring full depth construction and replacement of the central barrier. 

Subway and bridge modifications	Item	£250,000	Minor to intermediate works required to modify subway or bridge structures to create the space required to accommodate the cycle track. For example, works to modify bridge abutments. 
Street Lighting		**Cost (£)**	**Information**
Street lighting minor modification ('Standard' bus lane option)	/m.	£14	Assumes a lighting column (at £3500 each) is replaced every 250 metres along the corridor.
Street lighting 50% replacement ('Enhanced bus lane option)	/m.	£70	Assumes a lighting column (at £3500 each) is replaced every £50 metres along the corridor.
Street lighting full replacement (Busway option)	/m.	£140	Assumes a lighting column (at £3500 each) is replaced every £25 metres along the corridor.

Other Items		Cost (£)	Information
Berryden Road Corridor Phase 2	item	£10,000,000	Widening of the road carriageway between Printfield Walk and the Kittybrewster r/a as proposed by Phase 2 of the Berryden Road scheme. 

Other Items (continued)		Cost (£)	Information
Belmont Road bridge widening	item	£10,000,000	Replacement of the bridge over the railway to provide a wider road carriageway between Belmont Road and Leslie Terrace. 
Widening into railway land	item	£5,000,000	Extending the highway boundary into railway land (requiring a retaining wall) to widen the road carriageway south of Leslie Terrace. 

H.5 Summary

H.5.1 The above rate and itemized costs were combined with the quantities extracted from the concept designs for the corridor to provide the following estimates for each scenario (Sections I to IV).

Table H:2: Cost Summary

Intervention Level	Mode	Infrastructure + Preliminary Cost (£M)				Plus STAG Optimism Bias (£M)			
1: Standard Bus Lane	Total	**47.2**	**64.5**	**52.3**	**70.3**	**68.0**	**92.9**	**75.3**	**101.2**
	Bus	*29.9*	*47.2*	*33.9*	*52.3*	*43.1*	*68.0*	*48.8*	*75.3*
	Cycle	*15.5*	*15.5*	*16.6*	*16.2*	*22.3*	*22.3*	*23.8*	*23.3*
	Pedestrian	*1.8*	*1.8*	*1.9*	*1.8*	*2.6*	*2.6*	*2.7*	*2.6*
2: Enhanced Bus Lane	Total	**74.7**	**104.2**	**75.4**	**109.7**	**107.5**	**150.1**	**108.6**	**158.0**
	Bus	*54.0*	*81.9*	*54.5*	*86.9*	*77.8*	*117.9*	*78.4*	*125.2*
	Cycle	*18.2*	*19.9*	*18.7*	*20.4*	*26.3*	*28.7*	*26.9*	*29.4*
	Ped	*2.4*	*2.4*	*2.3*	*2.4*	*3.5*	*3.5*	*3.3*	*3.5*
3: Busway	Total	**129.1**	**163.8**	**141.8**	**163.5**	**185.9**	**235.9**	**204.1**	**235.5**
	Bus	*103.5*	*137.6*	*115.8*	*137.3*	*149.1*	*198.1*	*166.7*	*197.7*
	Cycle	*23.5*	*24.1*	*23.9*	*24.1*	*33.8*	*34.7*	*34.4*	*34.7*
	Pedestrian	*2.1*	*2.1*	*2.1*	*2.1*	*3.0*	*3.1*	*3.0*	*3.1*

Notes:

- The estimate of preliminary costs has been set at 15% of the infrastructure cost
- The appropriate level of optimism bias, as to be applied at this stage of the STAG process, (44%) has been applied to the infrastructure cost plus preliminary cost.

Appendix I Reallocation of road space

I.1 Reallocation of Space

I.1.1 To allow for the proposed route options B, C, D or E to be implemented, there will need to be a relocation of on-street car parking spaces and communal bins, and potentially third-party land requirements.

I.1.2 Reallocation of on-street parking is required:

- On Great Northern Road between Printfield Walk and Kittybrewster Roundabout to accommodate dualling / traffic gating (communal bin relocation also required).

I.1.3 On Great Northern Road between Kittybrewster Roundabout and Clifton Road to accommodate the proposed active travel proposals (communal bin relocation also required).

I.1.4 Potential third-party land requirements are likely required:

- To enable proposed left slip at Port Elphinstone
- Between Inverurie and Kintore to upgrade active travel shared-use route
- Between Kintore and Craibstone to accommodate proposed active travel track
- Between Craibstone and Printfield Walk to accommodate proposed active travel provision
- On Great Northern Road between Printfield Walk and Kittybrewster Roundabout to accommodate dualling / traffic 'gating'
- On Powis Terrace / Powis Place to accommodate proposed active travel provision
- At the Bedford Road railway bridge (Options C and E) to accommodate the bridge widening

I.1.5 Further, more detailed design work at the next stage in the appraisal process will allow for a greater understanding of potential third party land requirements.

I.1.6 The figure below shows the reallocation requirements across Printfield Walk to Mounthooly roundabout section of the route, within the more urban area of the proposals at the southern end of the corridor.

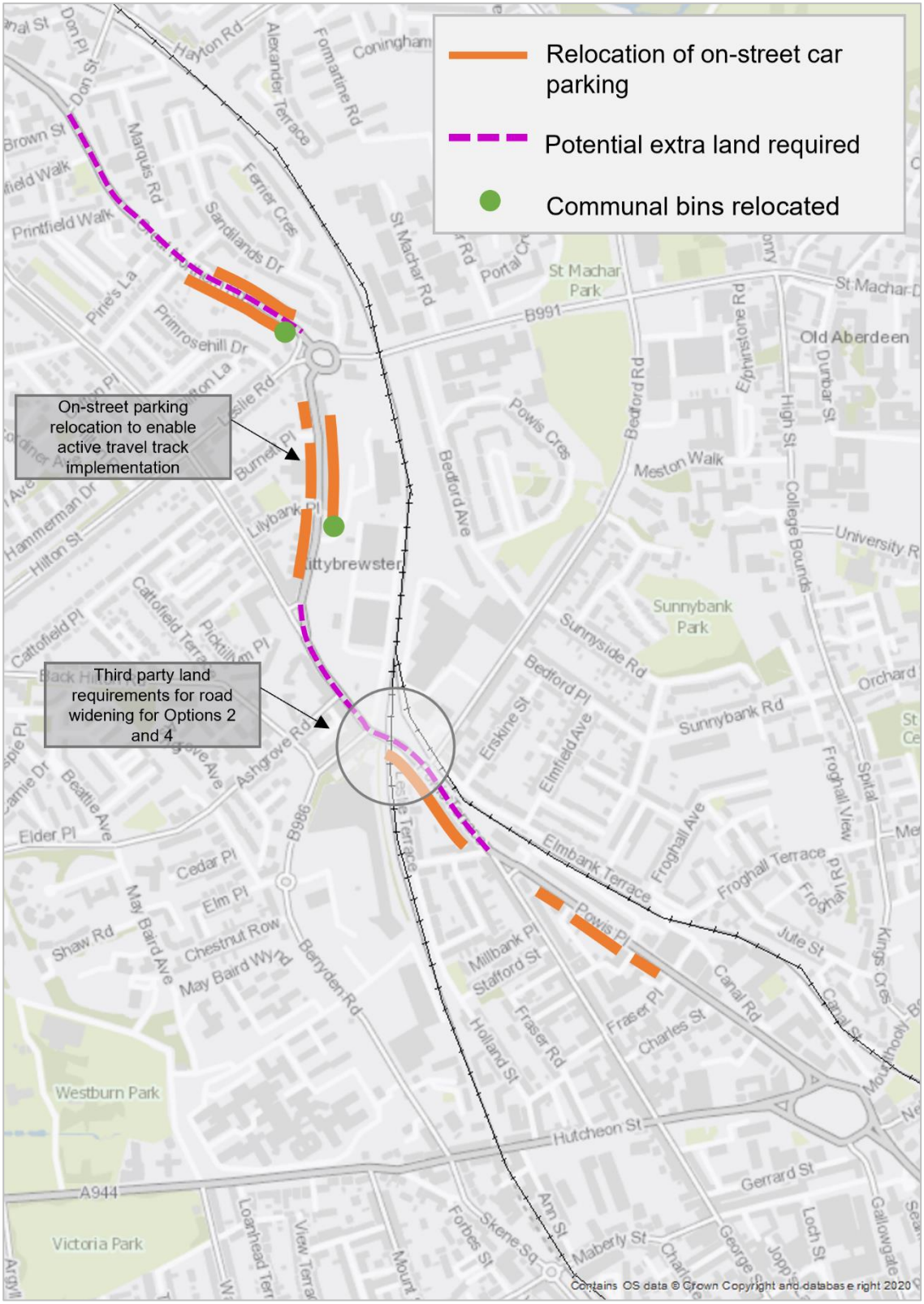


Figure I:1: Land Reallocation requirements (Printfield Walk to Mounthooly)

Appendix J Stakeholder and Public Engagement

J.1 Introduction

J.1.1 In order to inform the appraisal of the options, and in particular feed into the STAG public acceptability criteria, a stakeholder and public engagement exercise was undertaken towards the end of the Preliminary Options Appraisal.

J.1.2 An online interactive Arc StoryMap was live on Aberdeen City Council's Citizens Space consultation page for just over four weeks from 23rd February to 27th March (this was also available in hard copy if requested). The StoryMap provided background on the study, presented the options developed and each option's advantages and disadvantages, and then presented a set of embedded questions for feedback on the options.

J.1.3 The opportunity to respond to the survey was publicised through Aberdeen City Council's Citizen Space portal and the Council's media channels, as well as through on-bus publicity. It was also shared through direct contact with local councillors, community councils and other local interest groups to further publicise the survey within the communities most likely to be impacted by / benefit from the proposals. Furthermore, a link to the survey was provided to a range of stakeholders, who were invited to complete the survey on behalf of their organisation or respond directly by email to the study team with comments. Details of the stakeholders contacted can be found in the Stakeholder Engagement section below.

J.2 Stakeholder Engagement

J.2.1 Table J:1 lists the stakeholders contacted to inform them about the opportunity to respond to the survey.

Table J:1: Stakeholders Contacted

Group	Stakeholder
Active Travel	Aberdeen Outdoor Access Forum
	Aberdeen Cycle Forum
	Grampian Cycling Partnership
	Grampian Cyclists Touring Club
	CTC Grampian
	Cycling Scotland
Accessibility / Equality	Aberdeen Disability Equity Partnership
	Aberdeen Action on Disability
	Aberdeenshire Disability Equity Partnership
	Paths for All
	Co-Wheels
	Aberdeen City Youth Council
	North East Sensory Services
	Bon Accord Access Panel
Bus Operators	Stagecoach
	Bains Coaches

Group	Stakeholder
	First
Public Transport	Aberdeen Taxi Consultation Group
	Bus Users UK
	Confederation of Passenger Transport
	ScotRail
	Community Transport Association (Scotland)
	Transport Scotland
	Garioch Bus Forum
Health	NHS Grampian
Freight	Road Haulage Association
	Logistics UK
	Freight Transport Association
Education	Robert Gordon University
	North East Scotland College
	Scotland's Rural College (SRUC Aberdeen Campus)
	University of Aberdeen
Emergency Services	Police
	Police Scotland
	Scottish Ambulance Service
	Scottish Ambulance Service
	Scottish Fire and Rescue Service
	Scottish Fire and Rescue Service
Business	Aberdeen and Grampian Chamber of Commerce
	Federation of Small Businesses
	Opportunity North East
	Scottish Enterprise Grampian
	Federation of Small Businesses
	ASCO UK
	BP
	Aberdeen Council of Voluntary Organisations
Environment	SEPA
	Aberdeen Climate Action
	Aberdeen Friends of the Earth
	Aberdeen City Heritage Trust
	Historic Scotland
	NatureScot (Scottish Natural Heritage)
Elected Members	Aberdeenshire Council - Councillors
	Aberdeenshire Council - MSPs
	Aberdeenshire Council - MPs

Group	Stakeholder
	Aberdeen City Council - Councillors
	Aberdeen City Council - MSPs
	Aberdeen City Council - MPs
Community Councils	Dyce & Stoneywood (Aberdeen City)
	Tillydrone
	Bucksburn & Newhills (Aberdeen City)
	Northfield (Aberdeen City)
	Woodside & Hilton (Aberdeen City)
	George Street (Aberdeen City)
	Froghall, Powis & Sunnybank (Aberdeen City)
	Kintore & District (Aberdeenshire)
	Inverurie (Aberdeenshire)
Other	Aberdeen Civic Forum
	British Motorcycle Federation
	Aberdeen International Airport
	TECA - P&J
	TECA - Hotels
	TECA - Parking

J.2.2 In total, nine stakeholder organisations responded to the survey. Some 13 organisations provided written responses (outwith the survey) directly to the study team. On request, two individual meetings were held with stakeholders (Aberdeen Cycle Forum and Stagecoach) to further inform their consultation response.

J.2.3 Stakeholder written responses are summarised below. For those stakeholders who responded through the StoryMap survey, their responses are included in the public engagement summary in the next section.

J.2.4 In general, organisations welcomed the proposals to prioritise sustainable means of travel.

J.2.5 Improved public transport links and active travel routes between Aberdeen and towns along the A96 to Inverurie were welcomed and the considerable industrial development in Blackburn, Kintore and Inverurie and further substantial developments planned for land around Thainstone Mart and the former paper mill site, as well as expected residential development were noted to add to the transport burden along the corridor.

Active Travel

J.2.6 It was mentioned that the poor access to the cycle track at Inverurie results in a long detour to reach the existing cycle track. Improved access to the existing cycle track should be a priority over any upgrades to cycle infrastructure.

J.2.7 It was noted that there are many barriers to improving active travel infrastructure along the A96, such as limited verge widths, topography, busy roundabout junctions and barrier systems which can prevent access. The need to integrate proposals with the existing active travel network was noted.

J.2.8 One organisation highlighted the need for physical barriers between the dual carriageway and any cycle track or walkway as this will improve the safety of those who are visually impaired or deaf.

J.2.9 It was noted by one group that extra care should be taken where the cycle track interacts with footpaths, crossings and bus stops. Additionally, it was suggested that 'bus stop bypasses' can cause conflict between passengers and cyclists.

J.2.10 Support was noted for cycle track segregation with the proposed active travel options considered to be safe if the network was segregated. It was noted that the proposed segregated cycle track could encourage those who are less confident cycling to feel safer assuming that there are good crossings. Additionally, it was stated that that any improvement to active travel provision could make people more active. The health benefits of active travel were also noted.

J.2.11 It was also suggested by one group that a one-way (with flow) cycle track would be a more appropriate option for the urban area, with a mix and match approach more appropriate for the corridor (i.e., two-way segregated track in the more rural area of the corridor).

Bus Travel

J.2.12 It was also mentioned that to reduce carbon emissions, improving public transport links is key and should be prioritised. The need to improve surface access to Aberdeen Airport was noted.

J.2.13 It was noted that the current public transport makes it easy for patients to access healthcare facilities. It was noted that those who are visually impaired rely on public transport services and any improvement to services or frequency would be welcomed.

J.2.14 One bus operator highlighted that the busway intervention level (level 3) would be preferred as anything less would be unlikely to provide the journey time savings required. This level of intervention could also improve bus stops and see the introduction of bus rapid transit style stations.

J.2.15 A bus operator also noted that they would like to see a combination of variants C and D which would see bus priority measures implemented on both the BCIP / Denburn Road and Powis Terrace / Powis Place.

J.2.16 One organisation mentioned that the proposed options should increase the use of the Park & Ride sites which have received large investments from the Council.

J.3 Public Engagement

J.3.1 In total, 96 responses were received to the public survey, with 87 being from members of the public and nine being on behalf of an organisation. The responses are summarised below in relation to each question.

Respondent Background

Are you a member of the public or an organisation?

J.3.2 Respondents to the survey where initially asked if they were responding as a member of the public or on behalf of an organisation, with 91% noting that they are answering the following questions as a member of the public.

J.3.3 The nine organisations that submitted a response to the survey are detailed below:

- The Scottish Fire and Rescue Service

- Scotland's Rural College
- University of Aberdeen
- BP
- First Aberdeen
- Aberdeenshire Council Ward 19 (Mearns)
- Historic Environment Scotland
- Aberdeen Friends of the Earth
- Aberdeen Climate Action

Do you currently use the A96?

J.3.4 All the respondents were then asked if they currently use the A96 between Inverurie and the Mounthooly Roundabout. 98% of respondents use the A96.

How do you make these journeys?

J.3.5 The survey respondents were then asked to select which modes of transport they use to make their journeys along the A96. To note, this was a 'select all that apply' question so some individuals may have selected more than one mode of transport.

J.3.6 Figure J:1 displays the results. Just under half (49%) of all respondents noted that they travel by car. A further 16% travel by bus, 13% by bicycle, 11% by train and 6% walk.

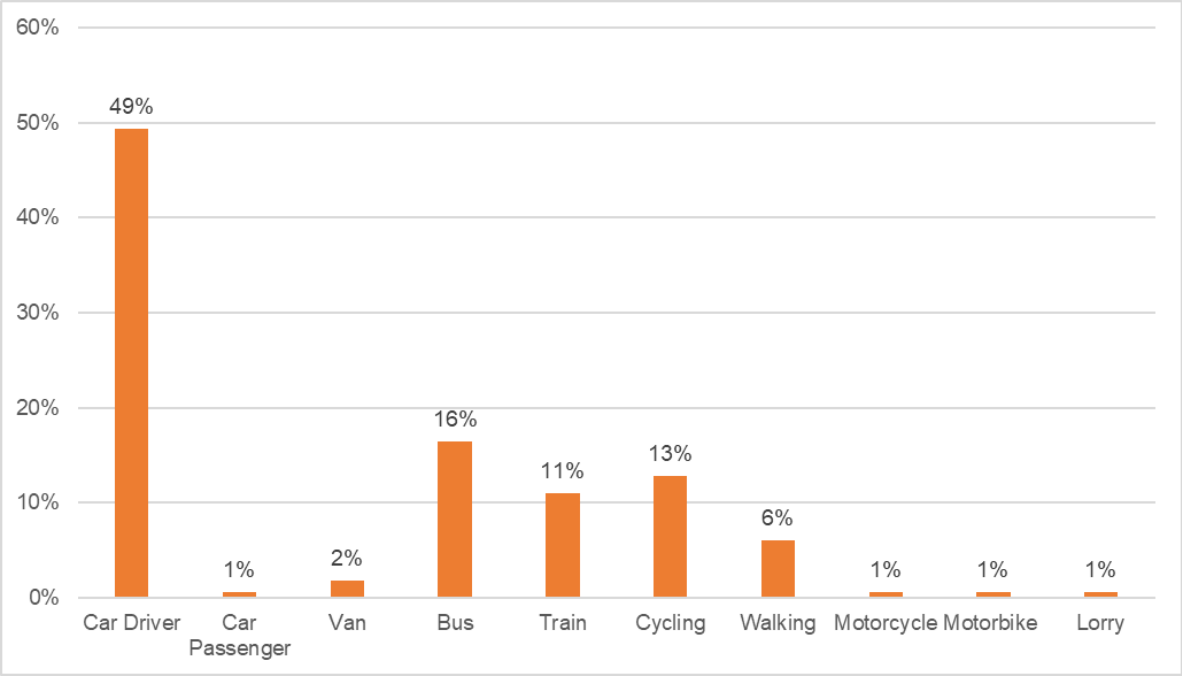


Figure J:1: How do you make these journeys?

Which area best describes where you live or where your business is based?

J.3.7 Both organisations and the public were asked to select, from a list provided, in which area along the A96 they live, or where their business / organisation is based. There was also an opportunity to state another location if the appropriate area was not listed.

J.3.8 Figure J:2 presents the results. Most of the responses are from those residing in Inverurie. A further 16% reside in the City Centre area, 8% from Blackburn, 7% from Bucksburn and 6% from Kintore. Overall, most of the responses are from those who live in Aberdeenshire or the outskirts of Aberdeen City.

J.3.9 A total of 28% noted that they live in areas which are not available in the options provided. The areas which were noted are:

- Kemnay
- Insch
- Clinterty
- Aberdeen as a whole
- Huntly
- Pitmedden
- Fraserburgh
- Meikle Wartle
- Banff
- Lyne of Skene
- Torry
- Newmachar
- Inverness
- Belhelvie
- Bridge of Don
- Berryden
- Ruthrieston
- Dyce
- Edinburgh

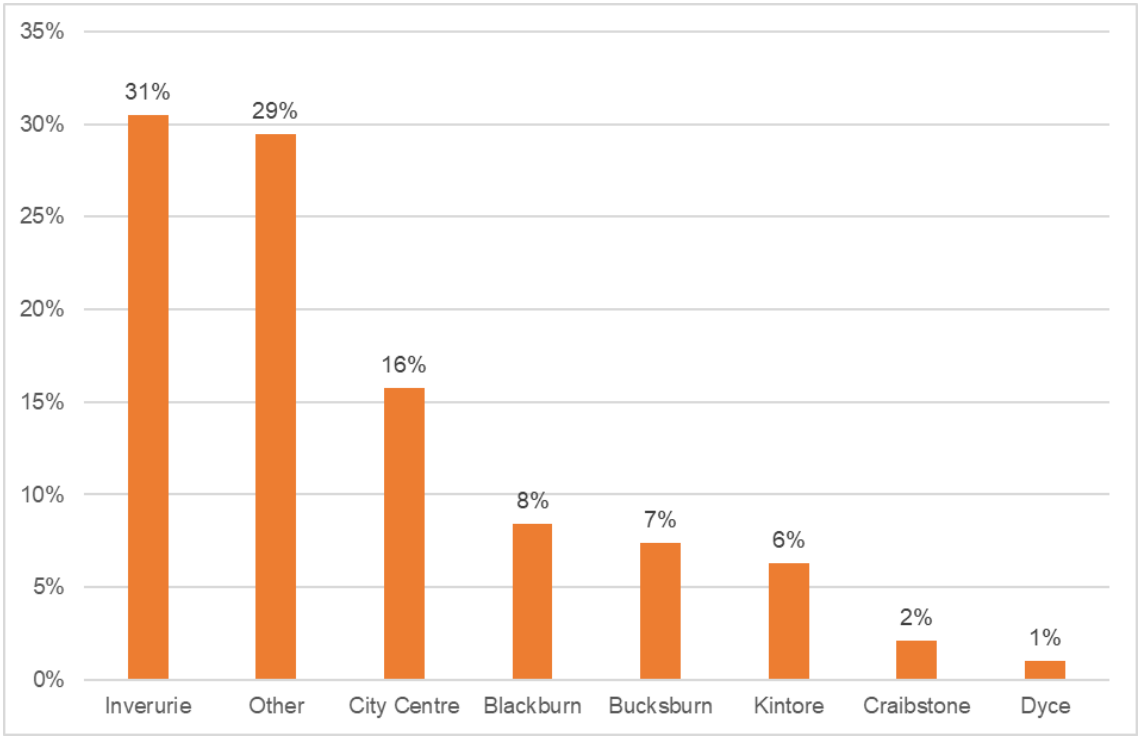


Figure J:2: Which area best describes where you live or where your business is based?

Which of the two active travel options do you think would be most appropriate along the A96?

J.3.10 The respondents were then asked their opinion on which of the two active travel options they felt would be most appropriate along the A96. Figure J:3 displays the results with 41% of respondents noting that they would prefer to have a two-way segregated cycle track implemented alongside the A96. An additional 28% stated that they would prefer a one-way (with flow) segregated cycle track and 18% have no preference between the two proposed options. Overall there is overwhelming support for the concept.

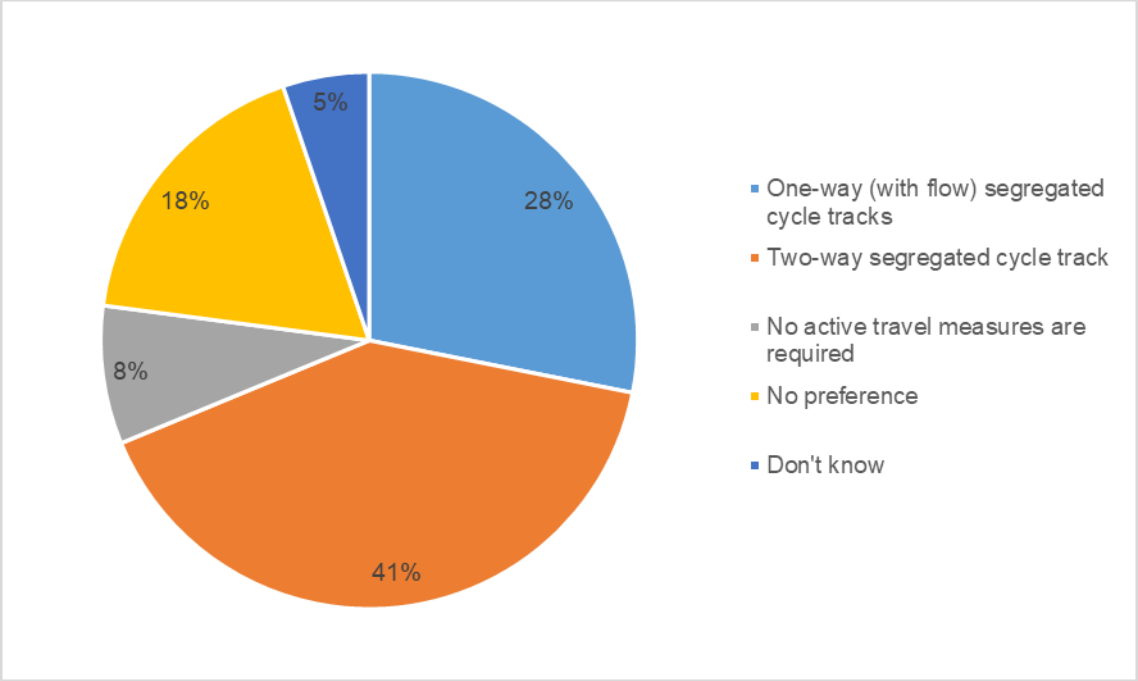


Figure J:3: Which of the two active travel options do you think would be most appropriate along the A96?

Would your preferred option encourage you to change your travel behaviour?

J.3.11 Based on their responses to the preferred active travel option question above, the respondents were then asked whether it would encourage them to change their travel behaviour, with the results presented in Figure J:4. 46% of respondents noted that they would change their travel behaviour while a further 40% stated that they would not change their travel behaviour. This does suggest there is some appetite for travel behavioural change, if the 'offer' is right.

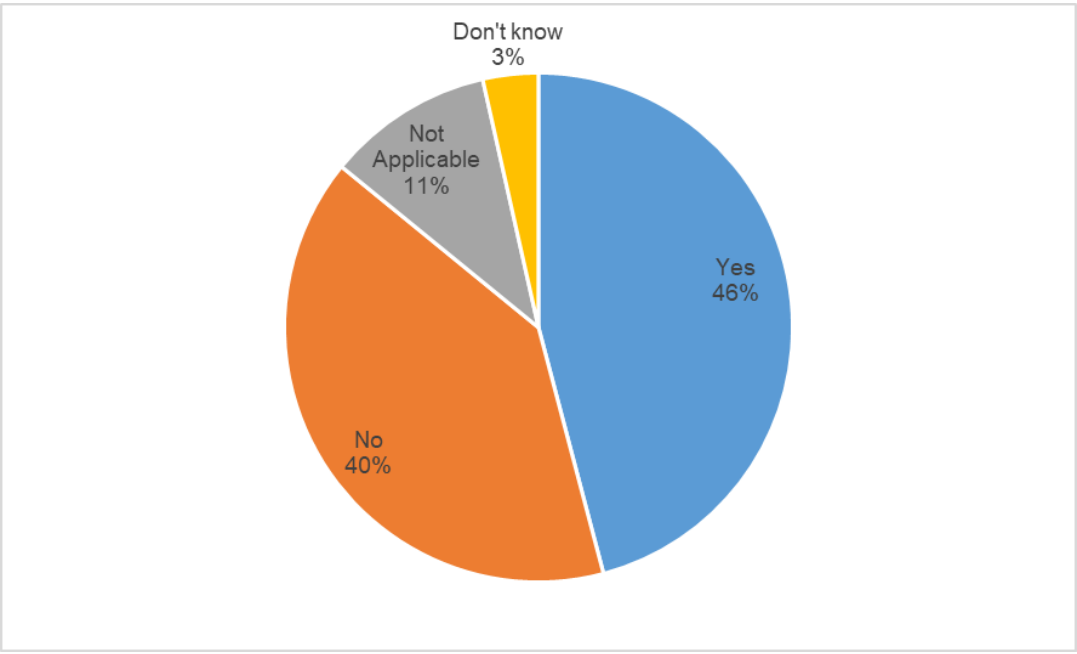


Figure J:4: Would your preferred option encourage you to change your travel behaviour?

Do you have any other comments on the proposed walking, cycling and wheeling proposals?

J.3.12 The respondents were able to provide any further comments on the active travel proposals through an open-ended question. A summary of the responses is outlined below.

J.3.13 It was highlighted by seven respondents that implementing segregated cycle infrastructure is a great idea and that for any cycle track to be safe for all, it was suggested that cyclists and pedestrians need to be segregated from each other as some cyclists currently use the pavements which makes it unsafe for pedestrians. Some 10 individuals noted that they would be more likely to cycle if the cycle track was segregated from other traffic and safe.

J.3.14 Three respondents stated that a safe cycle route would encourage them to cycle further.

J.3.15 Another three respondents noted that being able to cycle from Inverurie to Aberdeen without having to use the back roads would be good as currently there is no path beyond Kintore. Conversely, two respondents noted that cycling parallel to the A96 would not be a pleasant environment for pedestrians and cyclists and they suggested that trees be planted to segregate the cycle path from the dual carriageway. A further two respondents mentioned that it was not necessary to build a cycleway parallel to the A96 as the back roads suffice.

J.3.16 Two respondents highlighted that there needs to be clear signage along the cycle routes.

J.3.17 Another three individuals mentioned that there is a need for safe crossings along the A96 to allow safe access to all segregated infrastructure. It was also mentioned by one respondent that a two-way segregated cycle track would be the preferred option if it were able to be safely accessed by those who would have to cross the carriageway to use it.

J.3.18 It was highlighted that the issue with cycling along the A96 currently is the need to slow down for crossing side roads.

J.3.19 It was noted that the surface of the cycle track should be paved to reduce debris.

J.3.20 It was suggested that safe cycle storage be incorporated at Park & Ride sites and it was further noted that one of the main reasons that people choose not to cycle is because of the lack of secure cycle parking facilities.

J.3.21 It was highlighted that any improvements to infrastructure should be maintained to a high standard by the relevant Council.

J.3.22 One respondent noted that it is too far to cycle to Aberdeen from Inverurie when travelling to work and it was noted that cycling from Inverurie to Aberdeen is too far and steep.

J.3.23 One respondent highlighted that if there was a segregated cycle track along the A96, they would likely drive to Kintore to then cycle into Aberdeen City.

J.3.24 One individual mentioned that there should be space allocated on the buses to allow for bicycles to be taken onboard and facilitate long distance cycling regardless of the weather.

J.3.25 The presence of the Scheduled Monument Aberdeenshire Canal (remains of) on Station Road in the Woodside area was raised as an issue by one organisation as it would require consent from Historic Environment Scotland for any change close to the monument.

What level of bus priority do you think is most appropriate along the A96?

J.3.26 All the respondents were asked to indicate which level of bus priority intervention would be more appropriate along the A96. Figure J:5 displays the results, with 70% supportive of the concept and 30% noting that no bus priority measures are required.

J.3.27 Of the proposed intervention levels, there is an even split between the levels of intervention with 21% stating the busway level as being their preferred choice. 20% selected the enhanced bus lane priority level and another 19% chose standard bus lanes.

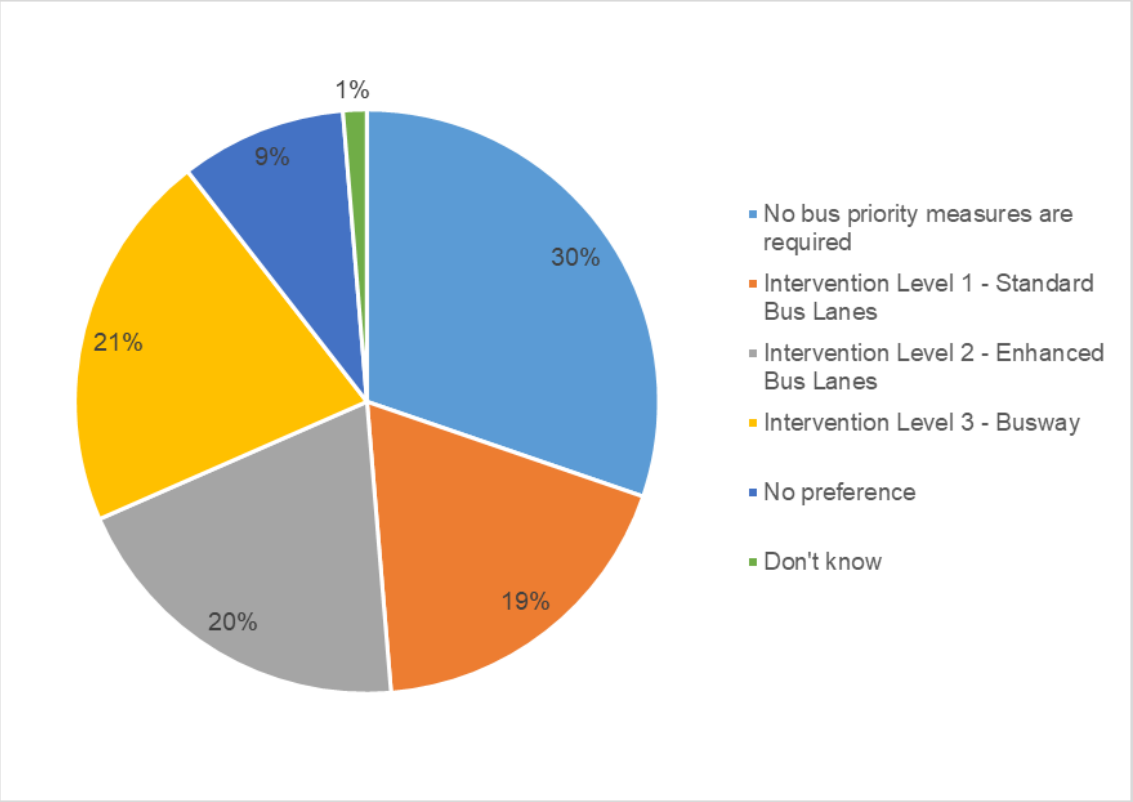


Figure J:5: What level of bus priority do you think is more appropriate along the A96?

J.3.28 The respondents were provided with an opportunity to give a reason for their preferred choice of bus intervention level. A summary of the responses is detailed below.

J.3.29 It was highlighted that busways will make it more difficult for emergency vehicles to pass through traffic as there is only one general traffic lane (without the ease of routeing through a bus lane in an emergency). Additionally, there could be an increase in congestion.

J.3.30 It was noted that enhanced bus lanes were the most beneficial as they are more flexible than busways. In contrast, the busway option was suggested to be the most effective in reducing bus journey times and future proofing road infrastructure, and two respondents noted that the busway provides the best opportunity for the future development of trams and high frequency services.

J.3.31 It was mentioned by one respondent that the enhanced bus lane option could cause traffic build up and not efficiently move traffic through junctions.

J.3.32 It was noted that public transport needs to be faster and cheaper than the car and that there is a need for end-to-end bus provision to encourage a modal shift.

J.3.33 Four individuals highlighted that there are no issues with bus travel along the A96 and the bus priority measures in place are sufficient. While another two noted that there is not enough traffic along the A96 to warrant bus priority measures.

J.3.34 It was also noted that any improvement to the current bus service would be beneficial.

J.3.35 It was suggested that a direct bus service which only serves Inverurie, Kintore, Blackburn and Union Square should be implemented to reduce the number of stops and overall journey time. It was also noted that there should be morning express services which do not serve every stop along the route. It was also noted that travelling by bus is inefficient due to the long journey times.

J.3.36 The importance of bus priority measures at traffic lights was highlighted.

J.3.37 It was highlighted by one respondent that enhanced bus lanes would be the safest level of intervention considering pedestrians, cyclists and motorists are close together.

Do you have a preference between the four route variants?

J.3.38 The respondents were then asked to select their preference of the four route variants, the results of which are presented in Figure J:6.

J.3.39 The figure shows a third (32%) of respondents stated that they did not have a preference but support new bus priority measures. The most popular route option was variant D which routes along the committed BCIP scheme between Kittybrewster Roundabout and Skene Square, and onwards to Union Square.

J.3.40 A further 17% noted that they do not think any bus priority measure should be pursued.

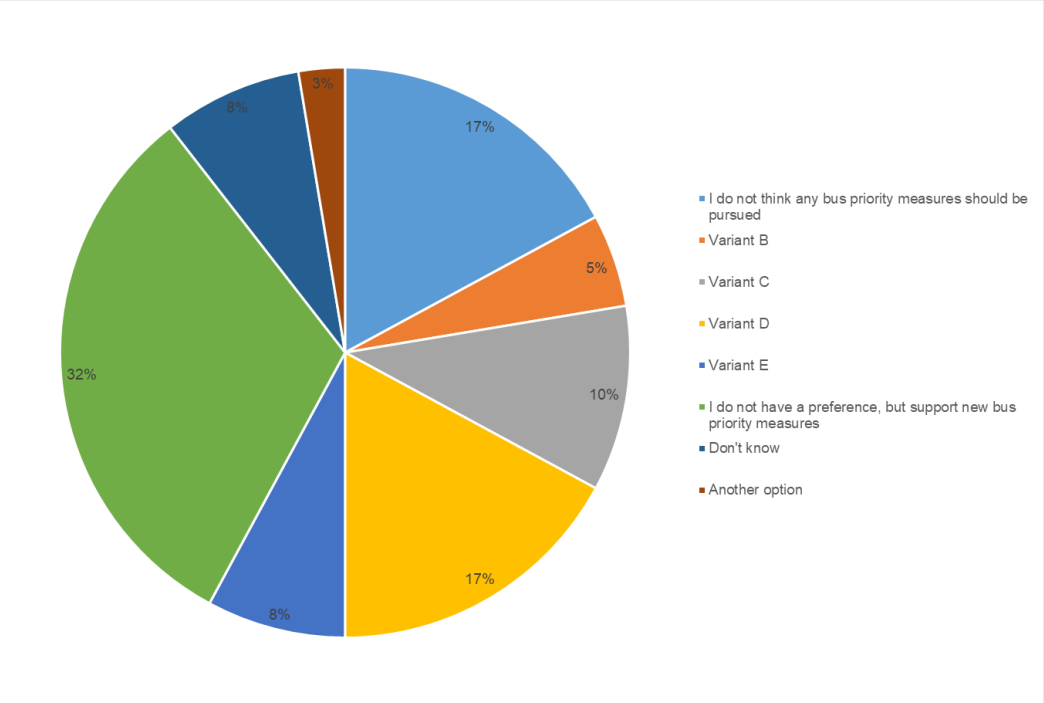


Figure J:6: Do you have a preference between the four route options?

J.3.41 For respondents who selected 'Another option', they were asked to detail what option they would prefer to be considered. One individual highlighted that a service which connected Inverurie to Aberdeen International Business Park should be considered.

Would your preferred route variant encourage you to change your travel behaviour?

J.3.42 Respondents were then asked to indicate whether the implementation of their preferred route variant would encourage them to change their travel behaviours. The results are presented in Figure J:7 below.

J.3.43 From the graph, the majority (36%) noted that they would not change their travel behaviour, while 26% stated that they would. A quarter of the respondents mentioned that they might change their travel behaviours because their preferred choice.

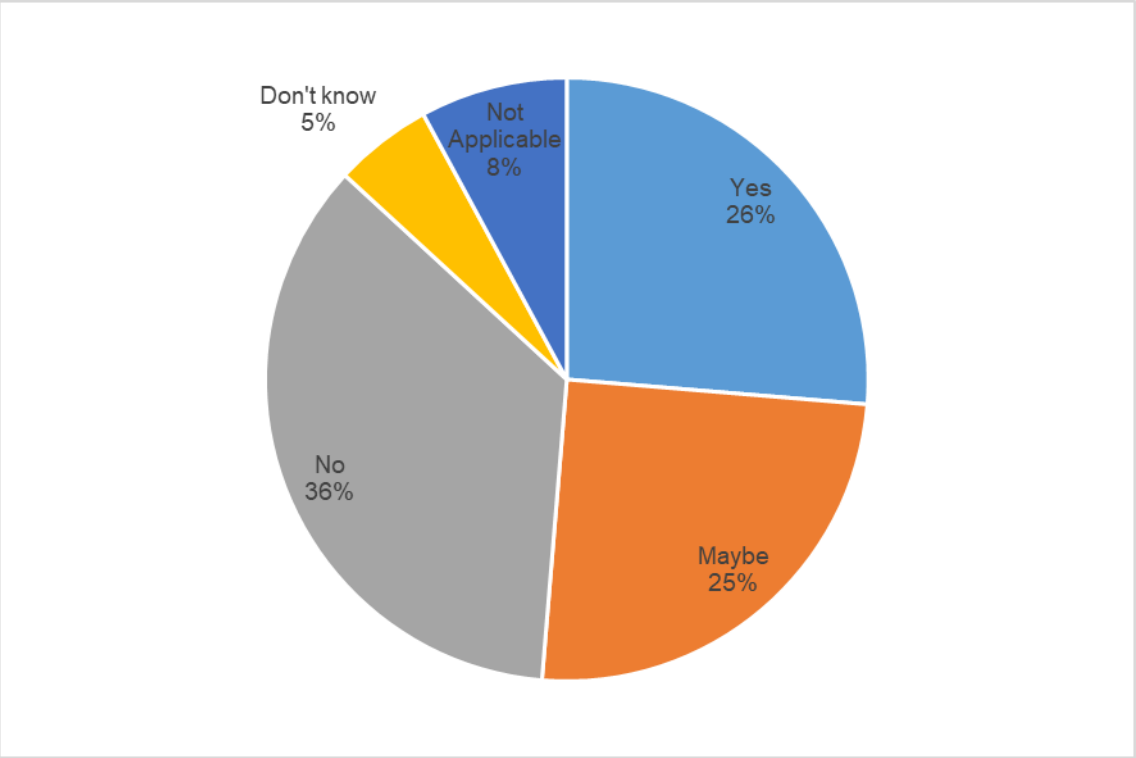


Figure J:7: Would your preferred route option encourage you to change your travel behaviour?

J.3.44 The respondents were then offered the opportunity to comment on why their travel behaviours would change. A summary of these comments is detailed below.

J.3.45 It was highlighted by four respondents that the bus service is currently inconvenient and slow. While another respondent added that it is also expensive.

J.3.46 One respondent noted that the cleanliness of the buses deters them from using the service.

J.3.47 Three individuals stated that bus services between Aberdeen and Inverurie serve their purpose as they are.

J.3.48 A member of the public highlighted that the introduction of bus priority lanes would not make the services dramatically quicker to compete with the car, although it was highlighted that if the time taken to travel by bus could match the journey time by car, then there would be a shift in behaviour.

J.3.49 Three individuals noted that they are set in their ways and are not willing to change how they travel, and it was also noted that taking the bus is not always practical.

J.3.50 It was noted by 13 respondents that they would travel to work by bus if it were more direct and quicker. One respondent added that they would use the bus services if they were more frequent.

J.3.51 One individual noted that serving the hospital adds significant time to the overall journey time.

J.3.52 Another six respondents stated that if the bus services were more affordable then they would travel this way into Aberdeen.

J.3.53 It was suggested by one individual that Inverurie could benefit from a Park & Ride facility.

Other Comments on the Study

J.3.54 Finally, the respondents were able to add any further comments on the study which they felt were not covered within the questions already asked. These responses are summarised below.

Active Travel

J.3.55 Three respondents noted that these proposed changes would be good, especially any improvement to active travel options.

J.3.56 Another individual suggested that there should be better access across the A96 for pedestrians to cross from Clinterty and Blackburn.

J.3.57 It was suggested that an electric bicycle hire scheme be implemented and that it be a free service.

Bus

6.2.10 It was noted that there needs to be an improvement in the bus services before active travel infrastructure is improved.

6.2.11 It was mentioned by one individual that the bus services should be made cheaper.

6.2.12 It was noted that in areas not served by the bus network many rely on the car as the roads are not safe for walking or cycling.

6.2.13 One individual added that they would benefit from more bus stops heading out of town towards Inverurie.

6.2.14 It was highlighted that buses which are parked in Inverurie town centre make it difficult and dangerous for pedestrians to cross the road.

6.2.15 One respondent added that they would support bus priority measures if they did not impede the movement of emergency vehicles or lead to more congestion.

6.2.16 It was noted that more services are needed which serve locations which are not in the city centre.

6.2.17 It was mentioned by one individual that there should be a bus service or shuttle which operates between Inverurie and TECA as it is currently difficult to reach TECA from Inverurie.

6.2.18 One respondent suggested that short term improvements such as more frequent services and the reduction in journey times be implemented first as any changes to infrastructure will take many years.

Rail

6.2.19 It was suggested that there should be a train station at the P&J Live arena and improved links to Aberdeen International Airport.

6.2.20 One respondent mentioned that there needs to be improvement in the frequency of train services as they are currently inconsistent.

6.2.21 One respondent noted that there should be a more frequent and affordable rail service between Inverurie and Aberdeen City.

J.3.58 It was mentioned that for residents in more rural areas to consider public transport there needs to be more reliable trains with longer operating days. It was also suggested that Kinaldie railway station should be reopened, and that the reinstatement of railway/tram lines should be considered.

Road Network

6.2.22 One respondent noted that because of the unknown decision on the A96 dualling, now was an inappropriate time to be looking at introducing a cycle link between Aberdeen and Inverurie.

6.2.23 It was requested that there should be greater consideration given to the Inverurie bypass.

J.3.59 It was suggested that there should be a reduction in the number of roundabouts along the A96 between Aberdeen and Inverness.

J.3.60 One respondent highlighted that there needs to be improvements made to the Port Elphinstone Roundabout as there are long tailbacks at this junction.

J.3.61 It was mentioned that there are numerous retail, education and leisure facilities along the A96 and that access to these cannot be restricted with the proposed changes.

J.3.62 One respondent mentioned that the poor condition of the roads and pavements is the main issue along the A96 and currently is not kept clean.

J.3.63 One individual noted that the BCIP is a bad idea as it prioritises the car over sustainable modes of transport and will only lead to more congestion.

Environment

J.3.64 It was mentioned by one respondent that the lack of green spaces and trees, rundown areas and a lack of amenities creates an unpleasant environment to cycle in.

TPOs

J.3.65 An organisation commented on the Transport Planning Objectives noting that they should also include the introduction of bicycle parking out of the city centre and a bicycle hire scheme, ticketing options to encourage bus use and the promotion of car share schemes.

Connections

J.3.66 It was highlighted that the A96 should link up with the A944 to provide better connections between areas.

Demographics

J.3.67 Respondents were asked if they would provide the first four digits of their postcode to allow us to understand where in relation to the A96 they live, or their business is based. The results of this are presented in Figure J:8.

J.3.68 The figure below shows that 44% of respondents were from the AB51 area which encompasses Inverurie, Kintore, Oldmeldrum, Kemnay and Port Elphinstone in Aberdeenshire. The second most frequently noted postcode is AB21. This area is also in Aberdeenshire and includes the towns / areas of Blackburn, Dyce, Newmachar, Newhills Bucksburn, Bankhead and Kinellar.

J.3.69 Additionally, there was a respondent from Inverness and one from Edinburgh.

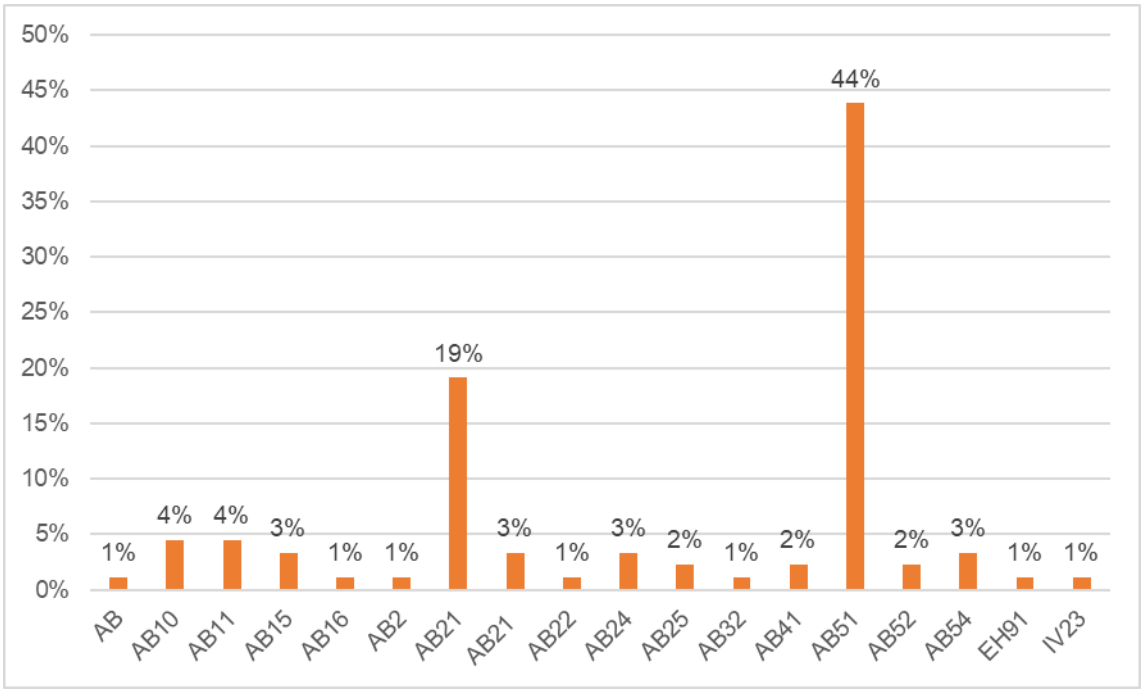


Figure J:8: Please entre the first four digits of your postcode?

J.3.70 Respondents were asked to indicate which gender they identify with. From Figure J:9, 52% of the respondents noted that they are male while 36% are female. A further 12% noted that they preferred not to say.

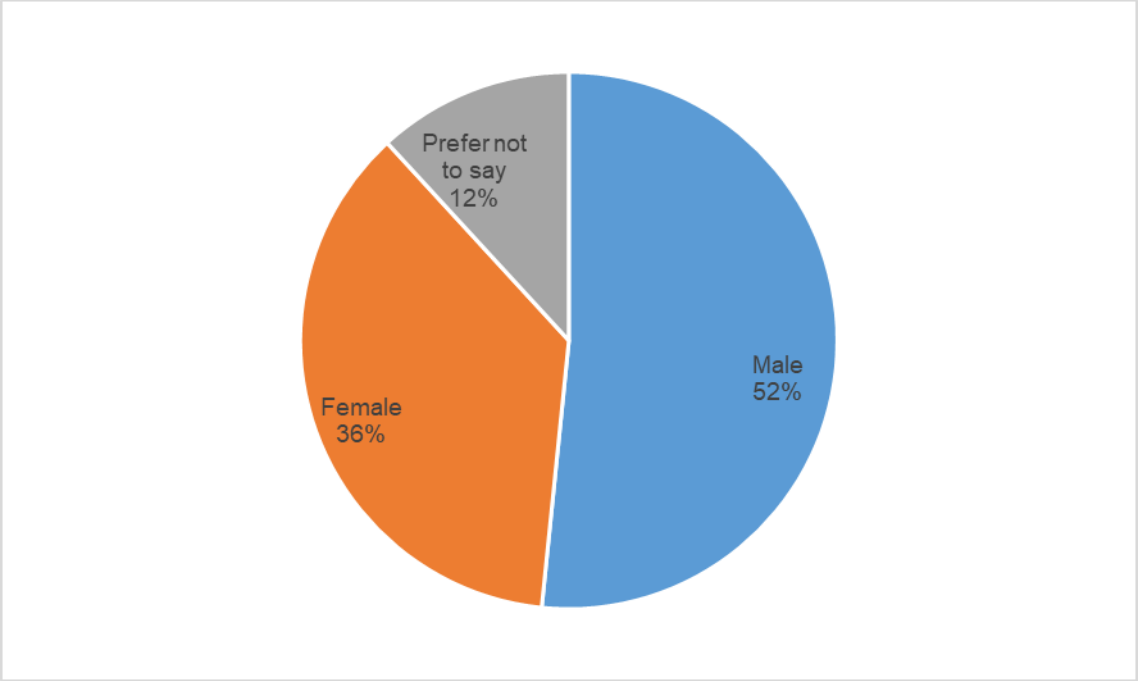


Figure J:9: Which gender do you identify with?

J.3.71 The age of respondents was also collected as part of the demographic data. The results of this are presented in Figure J:10. Around one quarter (23%) of respondents were in the age group 35-44 with the second largest (22%) age cohort being 45-54.

J.3.72 Overall, the majority of respondents were aged between 35 and 64, while a further 9% noted that they prefer not to say.

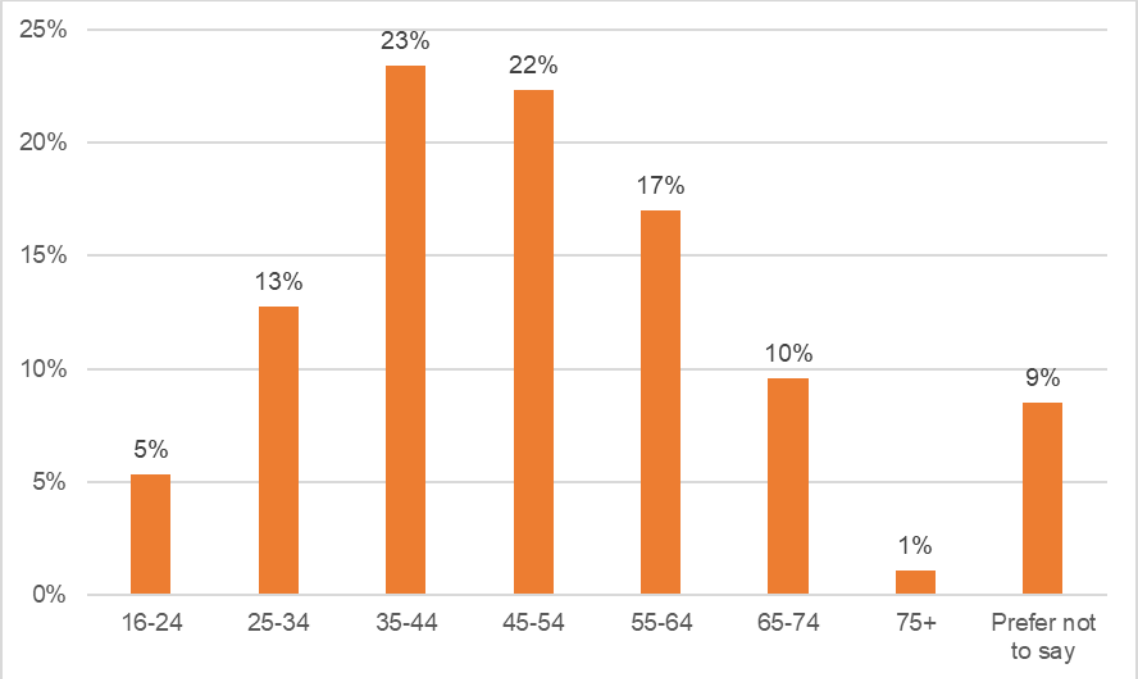


Figure J:10: What was your age at your last birthday?

J.3.73 Respondents were asked to note what their current employment status is, and the results are displayed in Figure J:11. From the graph, the majority of respondents (65%) are in full time employment, while 11% are employed part time. A further 10% noted that they are retired.

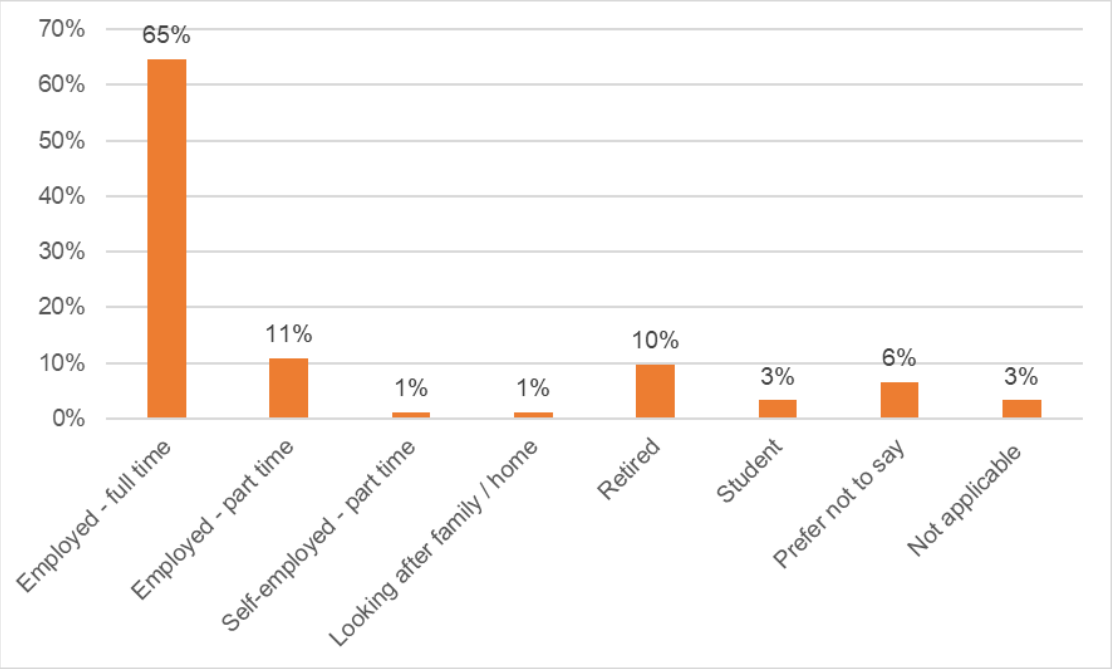


Figure J:11: What is your current employment status?

J.3.74 Respondents were then asked if they have a health condition or illness which affects their personal mobility, the results of which are displayed in Figure J:12. The vast majority of respondents (86%) do not have a health condition or illness. A total of 12% noted that they do have health condition or illness but it only affects their personal mobility a little.

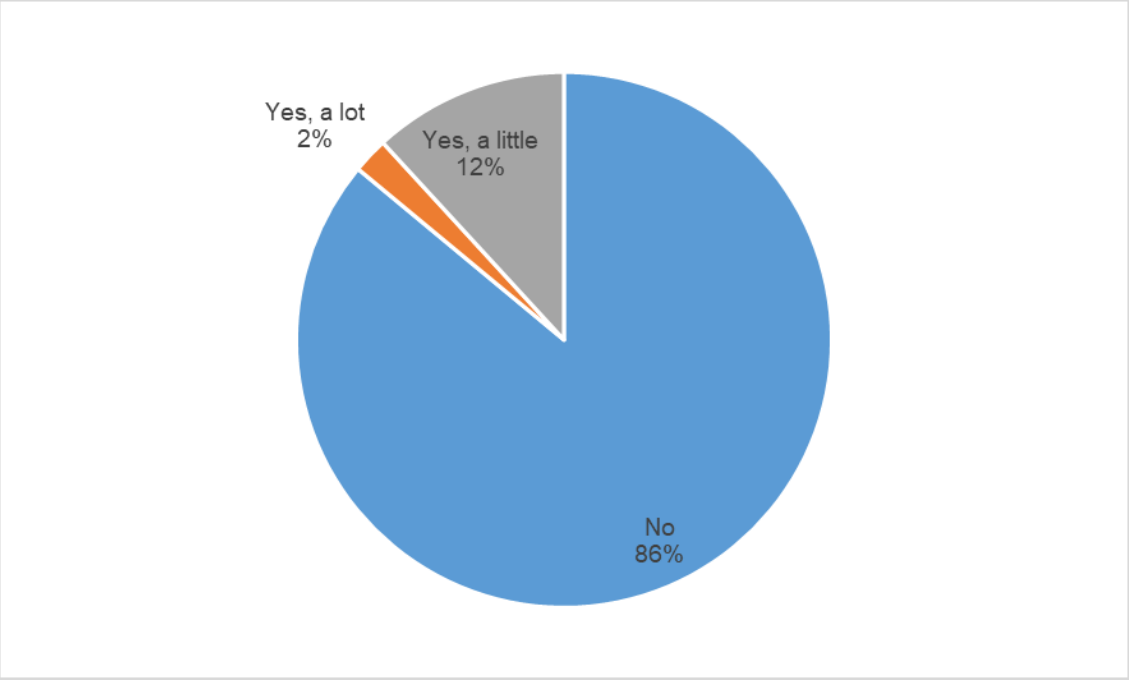


Figure J:12: Do you have a health condition or illness which affects your personal mobility?

J.3.75 Following from the question above, respondents were then asked if their illness or health condition affects their ability to use public transport. From the results shown in Figure J:13, only 2% noted that it affects them a lot and a further 1% stated it affects them a little. The remaining 97% stated that their ability to use public transport is not affected.

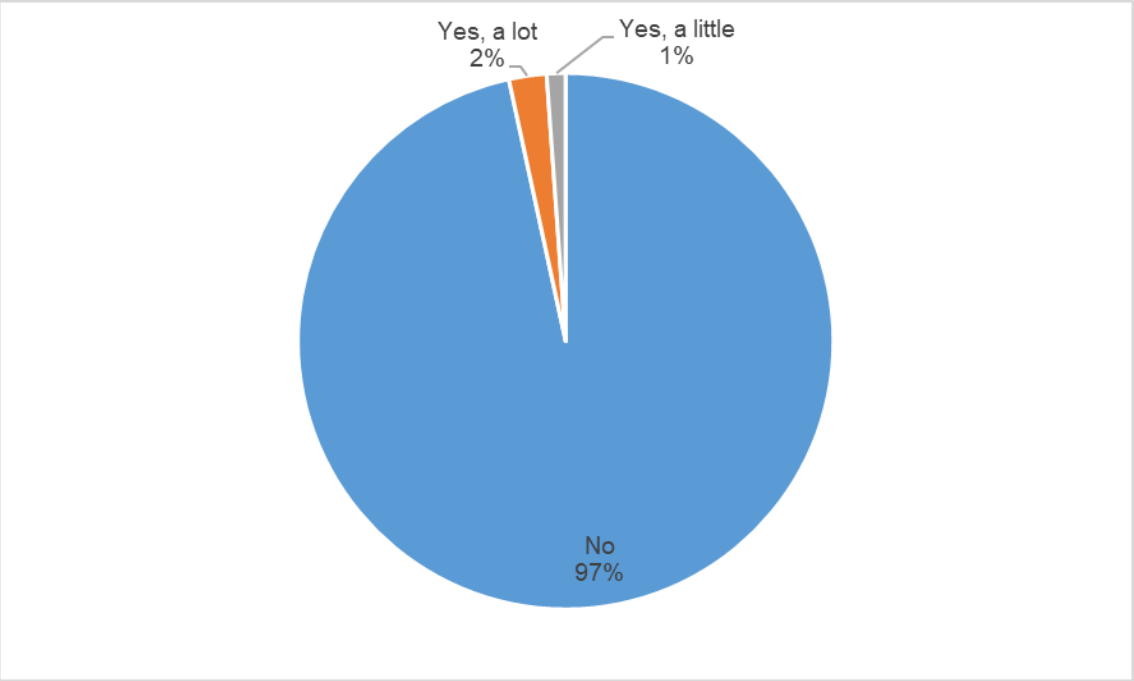


Figure J:13: Does your illness or health condition affect your ability to use public transport?

J.3.76 Finally, the respondents were asked to indicate the annual income of their household before tax. Most of the respondents noted that they prefer not to say what their income is. 12% of respondents noted that they earn between £50,001-£60,000 and another 12% earn between £80,001-£100,000.

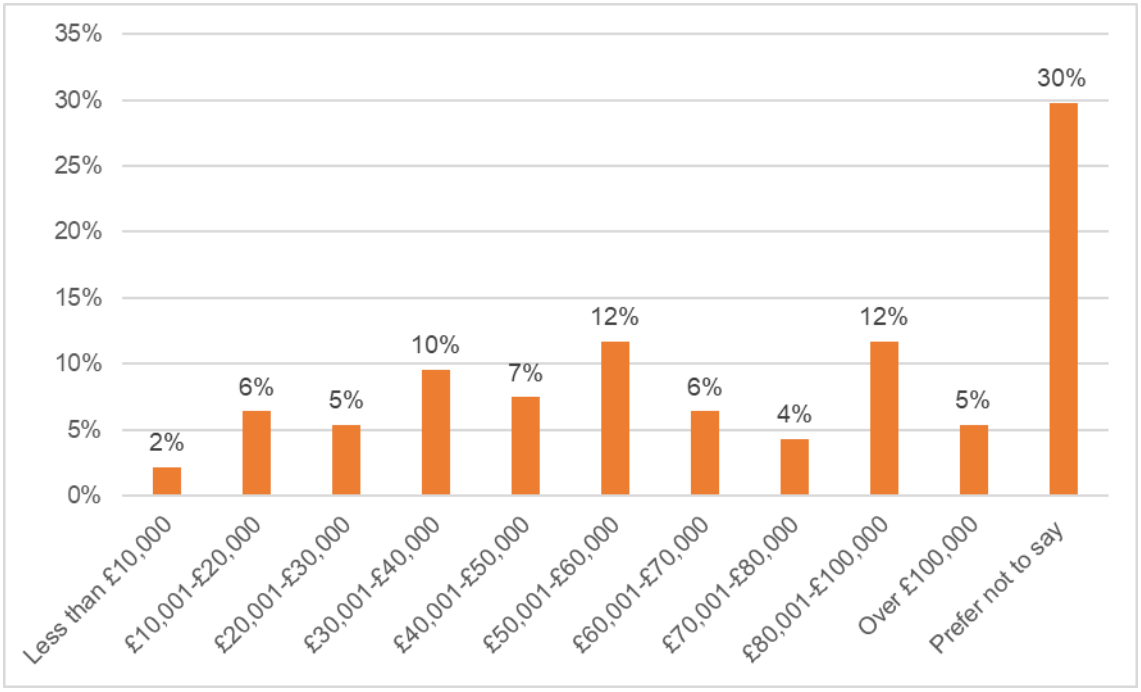


Figure J:14: Which of the following best describes the annual income of your household (before tax)?