Aberdeen Rapid Transit Routeing Analysis

Technical Report

On behalf of: Nestrans and the North East Bus Alliance

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Introduction

The Case for Change for the Aberdeen Rapid Transit (ART) scheme identified the problems and opportunities the scheme seeks to address, evidenced the rationale for the development of ART, and set out the associated scheme Transport Planning Objective. Subsequently, ART was developed and appraised through a Preliminary and Detailed Options Appraisal, considering the form of ART in terms of infrastructure, vehicles and services.

Several next steps were set out at the end of the appraisal, including further consideration to establish a definitive routeing for ART in terms of the corridors served and the nature of the cross-city connections. This report sets out the various strands of work undertaken to provide information to inform decision making on the routeing for ART and includes the outcomes of engagement and modelling work undertaken to inform this.

Key Findings

Given the main points raised during engagement and the evidence provided through the modelling outcomes, as presented in the body of this report, it is It is concluded that the optimum network for delivery at this time is two cross-city routes:

‘Red Line’ - Blackdog to Kingswells / Westhill:

- ART services from the west into the city centre are recommended to route via the A944 (Lang Stracht and Westburn Road) and into the city via Skene Square and Union Terrace to Union Square. Modelling outputs indicate this provides a greater modal shift to public transport and faster journey times into the city centre than if the route was via the A9119 (Queen’s Road). The A944 is less constrained and has the space required to accommodate the proposals.
- Running ART beyond Kingswells to Westhill is anticipated to increase modal shift to bus and could provide improved access to and from the town with a significant residential population and employment at Arnhall business park. A suitable Mobility Hub (MH) would be required as a terminus point in Westhill and further consideration of integration with services routing into Aberdeen from the hinterland is required. A phased extension of ART, beyond Kingswell, to Westhill should therefore be considered.
- The role of, and configuration of, Kingswells P&R with respect to ART should be reviewed, especially if ART extends further west to Westhill. At present, serving the Kingswells P&R site would add to journey times and with a Westhill service, the potential ‘targeted’ catchment for the site would be reduced. On-site surveys are recommended to better understand the current role of this site. If retained, upgrading of the site to a Mobility Hub and site reconfiguration to ensure improved access and egress for buses is required. The current site at Kingswells could also offer an opportunity for ART depot facilities (in the event of ART terminating at either Kingswells or Westhill).
- The Bridge of Don P&R site is not well located for access, has not been successful, and as such, is currently not served. Reconfiguring the site for improved vehicular and bus access would be a significant undertaking. The proposed mixed-use development at Blackdog and its location on the outskirts of the city at the junction of the AWPR and A90 provides an opportunity to develop a more appropriately located Mobility Hub to become the ART service terminus point to the north. Its location would also provide greater opportunity to capture demand from along the A947 i.e., Newmachar etc. A smaller parking facility at Bridge of Don could be provided to cater for more localised demand, with access from such a site through to stops on the main carriageway. It is recognised that Ellon P&R site lies approximately 17km to the north of Blackdog and as such there is likely to be some passenger abstraction from that site to Blackdog, with the potential for some increased vehicle kilometres due to users choosing to drive to the Blackdog site. However, consideration of how longer distance services from north of Aberdeen integrate with ART at

Blackdog would help minimise this. Early discussions with those developing the Blackdog site is recommended.
- With Blackdog as a terminus, the Cloverhill development would be served via suitable access from the development to an ART stop on Ellon Road

‘Purple Line’ - Craibstone P&R / airport to Portlethen Mobility Hub:

- Further consideration is required and discussion advised with Aberdeen Airport and TECA to determine the most appropriate routeing at the north-western end of the ART route, exploring the impacts on airport parking and revenue as well as access to TECA and the role of ART in supporting events at the centre. The role of Craibstone P&R should also be considered in this context.
- The optimum route along this corridor, taking on board feedback from bus operators in terms of key areas of demand, particularly the North East Scotland College, would be to route into the city centre via the A96 / Great Northern Road, Powis Terrace, Powis Place, Mounthooly, and then Gallowgate and Broad Street. Uncertainty around the development and timing of the Berryden Corridor Improvement Project creates a risk for the design on the route and needs to be managed as the ART infrastructure proposals progress.
- From Portlethen Mobility Hub, the analysis has identified that the optimum route for ART is via Wellington Road, West Tullos Road, Great Southern Road and Holburn Street before running the length of Union Street. Modelling outputs indicate this generates a greater modal shift response than a route via Wellington Road / Victoria Street. Engagement highlighted a desire that ART serve Union Street and this option provides that as the west end of Union Street is a key employment area in the city centre.
- In terms of implementation, it should be noted that Portlethen Mobility Hub is not yet built and the phasing of ART needs to take this into consideration given the site lies at a ‘greenfield’ location. As an alternative, the potential use of the existing Park & Choose at Chapelton of Elsick to form the southern terminus could be explored as an interim option to support in a phased delivery of ART.

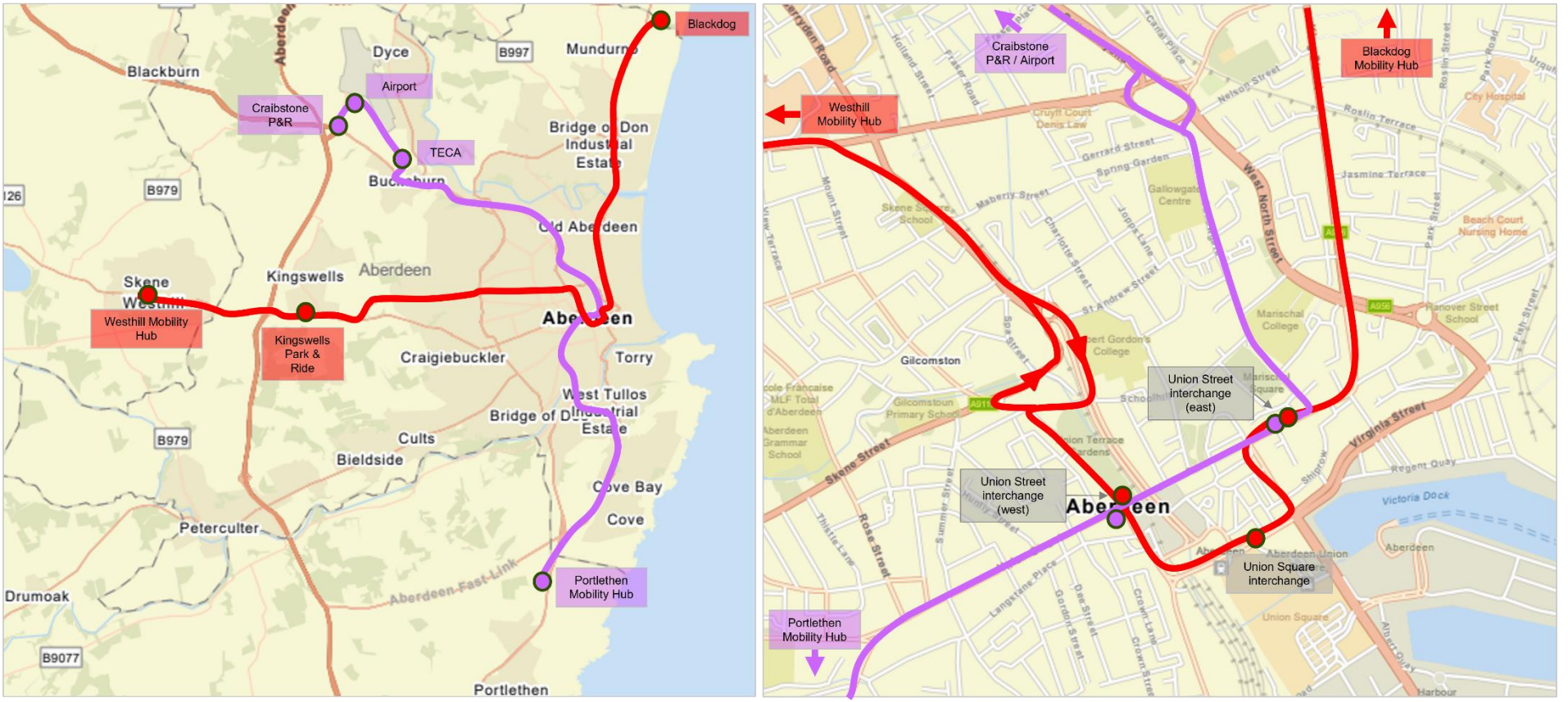
The two cross-city routes as set out above would ensure ART serves Union Square (and as such connect to the railway station and bus station) in addition to the full length of Union Street. The two services would interchange at the eastern end of Union Street between Market Street and King Street, as well as at the junction of Union Street and Union Terrace.

The resultant ART network, given the above recommendations, is set out in the figure below.

Further Considerations

Engagement highlighted the desire for ART to serve Robert Gordon University (RGU), and the many existing bus services operating between the University of Aberdeen (on King Street) and RGU. A test was undertaken which included RGU (and the beach) in the ART network (and altered the cross-city route connectivity accordingly). Under this test the modal shift achieved reduced compared to other tests. However, given the strong preference for its inclusion, how a connection to RGU could be included within the ART network requires further thought.

Serving the Beach area did not resonate as a strong priority through the engagement undertaken and the timescales for implementation and the build out associated with the Beach Masterplan adds a level of uncertainty. It could however be included as part of ART at a later date, with an RGU to a fully developed Beach area an option.



Recommended ART Network

1 Background

1.1.1 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%, 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 this 20% reduction in car kilometres and describes the key sustainable travel behaviours which make up the framework, in part to be achieved by investing in the public transport network.

1.1.2 As part of its response to the climate emergency, the Scottish Government committed to a long-term investment of over £500m to deliver bus priority measures on local authority and trunk roads. This is intended to **reduce the negative impacts of congestion on bus services** and **address the decline in bus patronage** to **help tackle the climate emergency** and **reduce private car use**. The investment takes the form of the Bus Partnership Fund (BPF) which supports the design, appraisal, approval, and delivery of infrastructure. The Fund focuses on the evidence of how bus services will be improved by addressing congestion, but the partnership approach is also expected to leverage other bus service improvements.

1.1.3 The North-East Bus Alliance partners (Aberdeen City Council, Aberdeenshire Council, FirstGroup, Stagecoach Bluebird, Bains and Nestrans) submitted an application to the BPF, which was successful, with £12m in funding awarded in June 2021. The funding has been used across a range of projects including the appraisal of significant bus priority in the city centre and on key routes into the city, and for an appraisal of the options for an Aberdeen Rapid Transit (ART) scheme (this study). It is worth noting that Transport Scotland announced a 'pause' in the BPF funding for the 2024/25 financial year. Although the future of the fund remains unclear at this time, alternative funding to progress the development of ART has been secured through the Aberdeen City Region Deal.

1.1.4 This work is being undertaken in the context of a vision to develop an ART network, detailed in the Regional Transport Strategy (RTS) and associated Nestrans ART vision document.[1] This study includes confirmation of the Case for Change (CfC), Preliminary Options Appraisal, Detailed Options Appraisal, and subsequent business case development.

1.1.5 The CfC for ART was reported in March 2022 (*Aberdeen Rapid Transit - Options Appraisal - Case for Change, Stantec, March 2022*) and presented the problems and opportunities identified, the rationale for the development of ART to address these problems, and the associated Transport Planning Objectives (TPOs). It also defined a set of 'success factors' for ART and presented a review of planned, under construction, and operational Bus Rapid Transit (BRT) schemes across the UK and Europe. The TPOs set for the study were:

- **TPO1**: Achieve average ART bus speeds on the urban sections of the ART corridors (i.e., within the Aberdeen city boundary) of at least 25kph (16mph) by 2030
- **TPO2:** By 2030, achieve a public transport service for which the timetables (with journey times reduced as per TPO1) are consistent across the day and the week, and where 95% of the services operate to within 5% of the timetabled journey time
- **TPO3:** Improve the perception of quality of bus travel on ART corridors by 2030

1.1.6 The Preliminary Options Appraisal for ART was reported in June 2022 (*Aberdeen Rapid Transit - Option Generation and Development / Preliminary Options Appraisal, Stantec, June 2022*) and detailed the option development process and the mainly qualitative appraisal of these options.

[1] https://www.nestrans.org.uk/wp-content/uploads/2021/06/Aberdeen-Rapid-Transit-Our-Vision.pdf

1.1.7 This Detailed Options Appraisal was reported in March 2023 (*Aberdeen Rapid Transit - Detailed Options Appraisal - Technical Report – Final, Stantec, March 2023*) and discussed the further development of the options progressing from the Preliminary Options Appraisal stage, and the key outcomes from the more detailed (and where possible quantitative) appraisal of the options.

1.1.8 The appraisal concluded that:

- Providing bus priority infrastructure alone does not meet the ART vision
- Increasing stop spacing provides significant reduction in bus journey times but may impact local accessibility
- Use of 'tram-style' multi-door vehicle provides:
  - Additional journey time benefits through reduced dwell at stops
  - Improved accessibility of the vehicle / ART network
  - Improved quality image of travel by public transport and differentiates the service
  - Revenue protection implications
- New 'platforms':
  - Improves quality / image of travel by public transport
  - Differentiates the ART corridors / network
- An integrated underlying bus network provides a more robust city-wide commercial proposition
- Mitigation required in areas affected by inappropriate traffic re-routeing

1.1.9 A number of next steps were set out at the end of the appraisal, including further consideration to establish a definitive routeing for the ART corridors and services – to be developed through discussion with those involved in the multi-modal corridor studies and through further engagement and modelling work.

1.1.10 **This report sets out the various strands of work undertaken to provide information to inform decision making on the routeing for ART and includes the outcomes of the engagement and modelling work undertaken to support this.**

2 Overview of work to inform ART Routeing

2.1 Overview

2.1.1 Two core strands of work have been undertaken to inform the routeing of ART:

- Engagement:
  - with Nestrans and Council officers
  - with bus operators
  - with Elected Members
- Modelling using the Aberdeen Sub Area Model (ASAM19) to provide quantitative analysis to compare routeing options and inform decision making

2.1.2 Engagement with Nestrans and Council officers and the bus operators was undertaken to inform the routeing tests to be modelled in ASAM19. Engagement with Elected Members was undertaken to provide further feedback into the process to inform the routeing decisions, with the overall process as shown in the figure below.

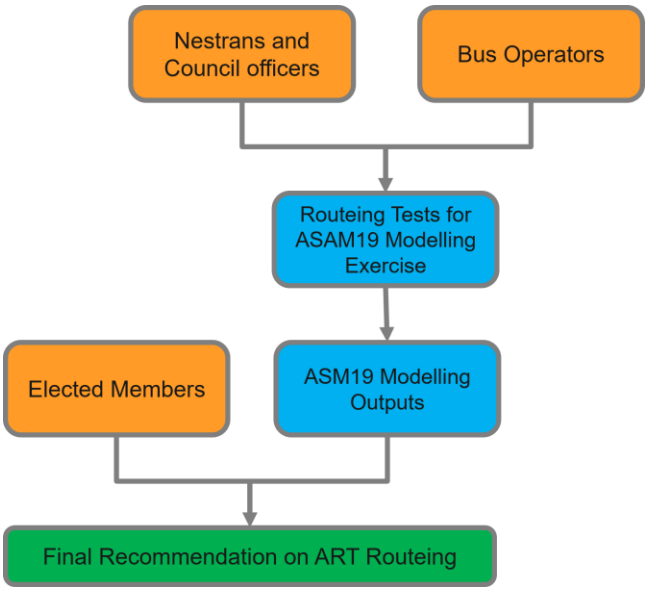


Figure 2:1: Tasks to inform ART routeing

2.1.3 Chapter 3 sets out the outcomes of the engagement with officers and bus operators to determine the routeing tests. The outcome of the engagement with elected members is set out in Chapter 4. Chapter 5 sets out the routeing test modelling outcomes, with Chapter 6 using these outcomes to inform a high level appraisal of the tests against TPOs (where appropriate) and STAG criteria. Combining this with the engagement outcomes, Chapter 6 presents a summary and conclusions, with a recommendation on the ART network and routeing, as well as other elements for consideration.

3 Determining the Routeing Tests

3.1 Methodology

3.1.1 Tests for consideration as part of this routeing analysis have been determined through:

- In terms of the network and routing:
  - Consideration of earlier analysis
  - A workshop with officers from Nestrans, Aberdeen City Council and Aberdeenshire Council
  - Discussion with the two major bus operators operating within the region - First and Stagecoach
- In terms of modelling assumptions assumed in the testing:
  - Discussion with those undertaking the corridor studies to determine the latest assumptions in terms of the bus priority infrastructure that could be assumed to be in place along the corridors of interest –details regarding this can be found in *Supporting Technical Note A: ART Routeing Analysis - Infrastructure Assumptions (Stantec, March 2024)*
  - Undertaking analysis to determine, for all the tests being considered, the changes required to the underlying bus network to integrate with the assumed ART network for each respective test – as opposed to modelling ART simply layered 'on top' of the existing network. This exercise sought to ensure modelling a more likely Aberdeen-wide bus network if ART were implemented - details regarding this can be found in *Supporting Technical Note B: ART Routeing Analysis – Bus Network Changes (Stantec, March 2024)*

3.2 Earlier analysis

3.2.1 Work was undertaken during the Preliminary Options Appraisal using the matrices from ASAM to consider various ART networks and their potential passenger catchments. Eleven different network permutations were considered. This provided an early indication as to how different ART networks compared to one another. Note that no modelling was undertaken, with the work analysing the origin-destination matrices and applying assumptions with regards to potential modal shift based on whether trips were considered 'in catchment' for ART, whether ART was within walking distance of the origin and destination, whether interchange between bus services was required, the potential to use the P&R sites, and existing mode choice.

3.2.2 Not all network permutations could be modelled as part of the Detailed Options Appraisal (due to time and budget constraints). As such, the above analytical work provided a guide as to the most appropriate ART network to be taken forward into a full ASAM19 modelling process in the detailed appraisal. At this stage, all the ART options were modelled on the same ART network which enabled comparison between the options and provided an indication of how the options performed all other things being equal. That was not to say however, that the network chosen for the modelling in ASAM at that time was the preferred network, just that it was considered at that stage to be the most appropriate network on which to undertake the ASAM testing.

3.2.3 The analysis as described above can be found in the Preliminary Options Appraisal Report and Detailed Options Appraisal Report respectively.

3.2.4 The outcomes of this work provided the basis for the discussions to determine the ART network and routes for testing as set out below.

3.3 Routeing – Discussion of Corridors and Terminus Points

Introduction

3.3.1 The discussion which follows in this section presents the information discussed with both Nestrans / Council officers (at a workshop) and the bus operators (in one-to-one calls) to inform the set of network and ART cross-city service routes for modelling within ASAM19.

3.3.2 A commentary around each of the ART corridors is presented with the key points noted from the discussions set out within this. The workshop with Nestrans / Council officers took place at Aberdeenshire Council's Woodhill House office on 26th September 2023, with the one-to-one discussion with Stagecoach and First taking place on 6th and 15th November 2023 respectively. The main points raised and discussed during these meetings are presented below.

Overview

3.3.3 Across the Aberdeen wide area, **routes** and **terminus points** for ART were considered along broadly north, north-west, west, and south corridors as shown in Figure 3:1, and broadly reflect the ART vision document. These corridors are discussed below in turn.

Figure 3:1: ART corridors under consideration

North Corridor

3.3.4 Figure 3:2 shows the routes and terminus points considered for the north corridor. This consist of:

- Routeing via:
  - King Street (A)
  - Beach Boulevard / Esplanade (B)
- Terminus points:
  - at the, currently unserved, Bridge of Don P&R site and, recognising the significant developments proposed further north, at Cloverhill or Blackdog
  - at the Beach, recognising the significant Beach Masterplan proposals – note that this would not be at the expense of serving a terminus further north, but likely as part of a cross-city route with one of the other corridors (see later section)

Figure 3:2: North Corridor Considerations

3.3.5 Through the officer workshop and bus operator discussions it was noted that:

- Routeing via King Street (A) was preferred as a route north given the number of trip attractors and generators along the route including the football stadium, Aberdeen Sports village and the University of Aberdeen campus
- The route north via the Esplanade (B) was not considered worthy of further consideration given the large area north of the Beach masterplan area serving few trip generators and attractors and missing the major destinations on the King Street route
- The Beach masterplan development would make the beach a key destination within the city and was considered as important for inclusion in the testing, but with the area a terminus point for ART
- Testing should include terminus points for the ART route at both Cloverhill and Blackdog, with an assumption of a Mobility hub (of around 200 spaces) assumed at Blackdog. The potential impact of this on both Ellon P&R and the currently unserved Bridge of Don P&R was noted to require consideration during the testing outcomes analysis.
- The Bridge of Don P&R site would require site reconfiguration to enable faster bus access to the site and less convoluted vehicular access, with options for ART stops to be located either within the P&R site or on the main Ellon Road depending on access arrangements. It was assumed that in any testing that ART services would stop on the main route north (Ellon Road) with passenger access provided from the P&R site to the bus stop on Ellon Road with suitable pedestrian crossing facilities provided to enable passengers to access the site from the northbound (west) side of the carriageway.

North-West Corridor

3.3.6 Permutations for ART on the north-west corridor were considered at both the west and east end of the corridor.

3.3.7 Figure 3:3 shows the routes and terminus points considered at the **western end of the corridor** and includes:

- A terminus at Craibstone P&R – with a route directly along the A96 to the P&R site (A)
- A terminus at the Airport - with a route directly along the A96 to the P&R site and then on to the airport (A)
- A terminus at Craibstone P&R with routeing via TECA and the airport (B)

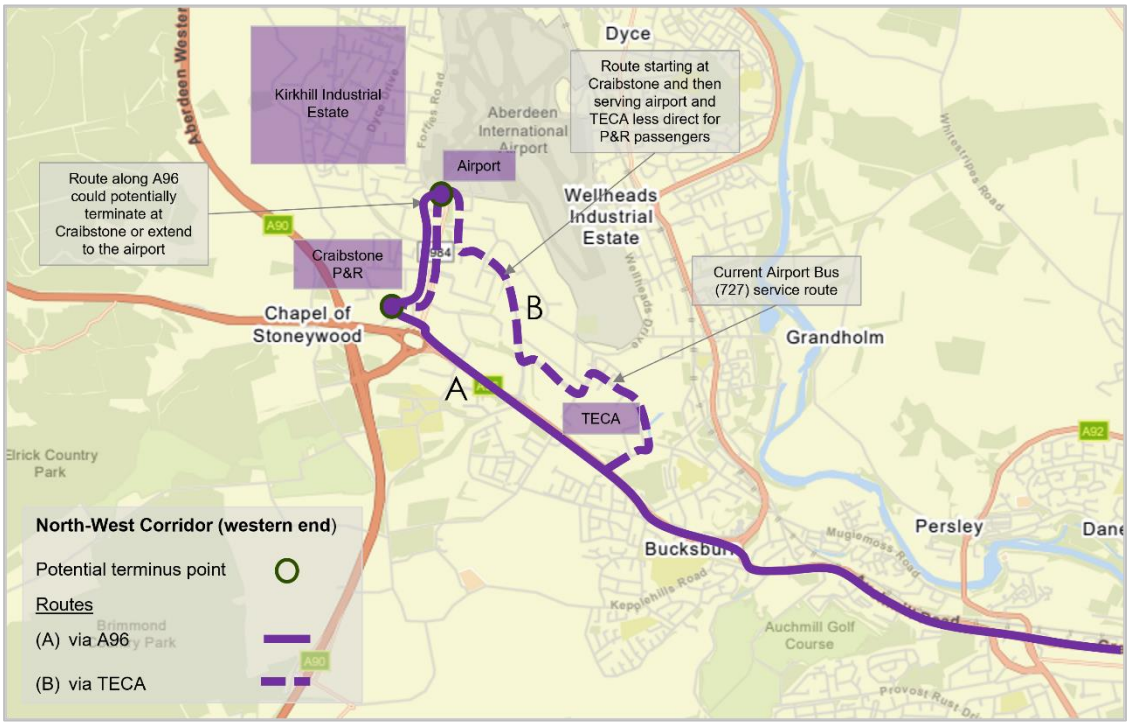


Figure 3:3: North-West Corridor Considerations – West end of corridor - Terminus points and routeing

3.3.8 Through the officer workshop and bus operator discussions it was noted that:

- It was considered desirable that ART serve the airport as a key destination in the city
- It was considered that a route via TECA (as per the current airport 727 bus service) was most appropriate. The walking access to TECA from the A96 (if an ART service routed directly along the A96 and not via TECA) was not considered desirable and would be difficult to implement
- It was noted that an outbound route via TECA and the airport to Craibstone P&R (and the same inbound) would be convoluted and unattractive for those joining the service at Craibstone P&R. This may detract from the use of the ART service by those in Aberdeenshire
- The potential for the ART service to route both clockwise and anti-clockwise at the western end of the route (i.e., operate both city → TECA → airport → Craibstone P&R → city, and city → Craibstone P&R → airport → TECA → city), was noted by a bus operator. This would mean every other ART service would be a direct service from Craibstone P&R into Aberdeen, similarly with regards to services to and from the airport. Such service operation could however be confusing for passengers.
- There are potential issues with Craibstone P&R site being used as an airport car park – although parking restrictions could stop this if desired (e.g., no overnight parking). Issues are recognised with regards to the potential impact on the airport revenue stream for parking if Craibstone P&R were used in such a way.
- There is potential for the development of an ART depot at Craibstone P&R.

3.3.9 Figure 3:4 shows the routes and terminus points considered at the **eastern (city) end of the north-west corridor**, and includes a route into the city centre from Kittybrewster, either:

- Between Kittybrewster and Clifton Road:

- (i) via the Berryden corridor (committed but yet to be constructed scheme linking Skene Square and Kittybrewster Roundabout)
- (ii) via the existing Great Northern Road between Kittybrewster and Clifton Road

- Between Clifton Road and the city centre:
  - (A) via Powis Terrace / Powis Place to Mounthooly and then Gallowgate to reach Union Street
  - (B) via Skene Square / Denburn to Union Square (and then assumed onwards to Union Street via Market Street)
  - (C) via Skene Square / Woolmanhill Skene Street / Rosemount Viaduct / Union Terrace to Union Street[2]

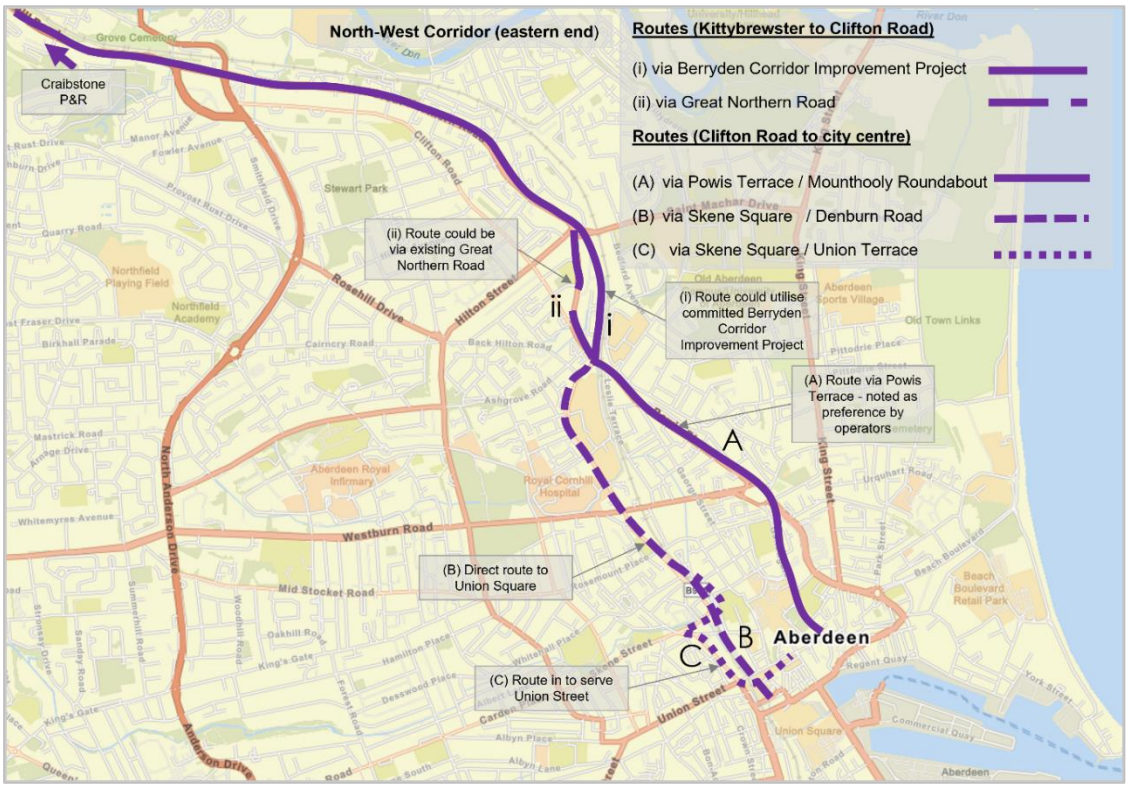


Figure 3:4: North-West Corridor Considerations – East end of corridor - Routes into city centre

3.3.10 Through the officer workshop and bus operator discussions, and through other studies, it was noted that:

- Additional bus priority on the Berryden Corridor Improvement Project (BCIP) between Kittybrewster and Clifton Road may detract from the objectives of the BCIP scheme (although the project should deliver benefit to buses through the proposed improvements to reduce traffic congestion in general)
- Engagement on the A96 Multi-modal corridor study highlighted operators favoured a route along Powis Terrace and Powis Place (A) given the volume of passengers boarding and alighting along this section

[2] Note a new bus only southbound link would be required to connect Denburn Road and Blackfriars Street

- Engagement on the A96 Multi-modal corridor study highlighted that a route into the city centre from Mounthooly via Gallowgate / Broad Street (A) (as opposed to via West North Street) was considered the most appropriate given the exiting bus priority and destinations served on Gallowgate (including North East Scotland College and the main Aberdeen City Council offices at Marischal College)

- Routeing via Denburn Road to Union Square (B) (and then assumed onwards to Union Street via Market Street) - while offering a direct and quicker route to Union Square, would provide limited opportunities to access the service given limited connections to the route on Denburn Road. In addition, a similar route(s) in from the west accessing the city centre via Denburn Road (see below for West corridor) may not be desirable given the overlap.

- Routeing via Woolmanhill / Skene Street / Rosemount Viaduct / Union Terrace to Union Street (C) - would better serve a range of destinations compared to a route via Denburn Road (B). Such a route could also provide access to Union Street (from Union Terrace to King Street) than a route via Union Square (noting that another ART route could serve Union Square). Again, a similar route(s) in from the west accessing the city centre via Union Terrace (see below for West corridor) may not be desirable given the overlap.

- Understanding how the north-west route interacts / is part of a cross city route with the routes from the north (see above) and / or the route from the west (as discussed below) will have a bearing on the routeing decisions for the north-west corridor

West Corridor

3.3.11 Figure 3:5 shows the route and terminus points considered for the north corridor. This consists of:

- Routeing:
  - via the A944 (Westburn Road / Langstracht) (A)
  - via the A9119 (Queens Road / Skene Road) (B)
- Terminating at:
  - Kingswells P&R
  - at Westhill

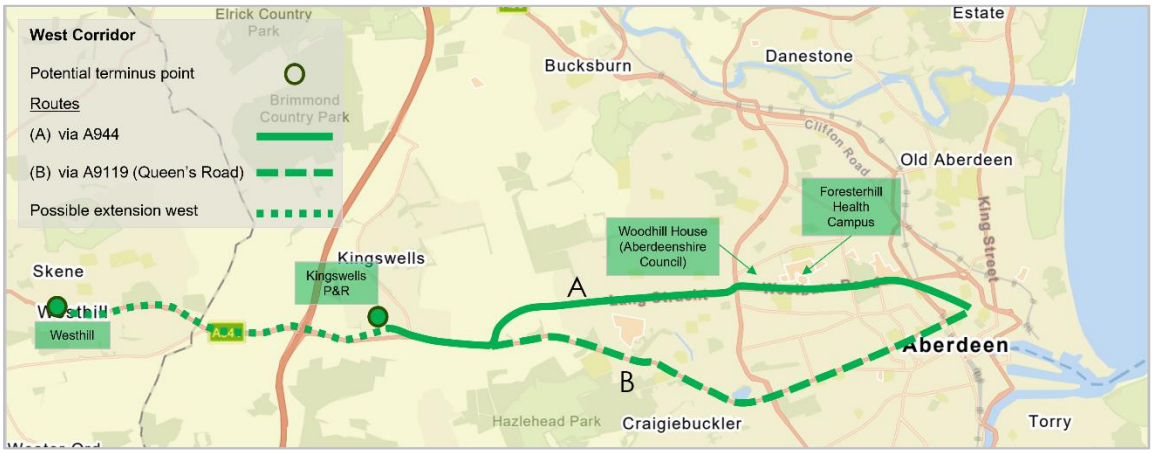


Figure 3:5: West Corridor Considerations

3.3.12 Through the officer workshop and bus operator discussions it was noted that:

- It was considered essential that ART serves the Foresterhill Health Campus, where Aberdeen Royal Infirmary, and other regional health facilities, are located
- The existing strong bus market on the A9119 (B) was noted by operators. However, work on the A944 / A9119 Multi-modal study highlighted the more constrained environment for providing significant bus priority on the route (as would be required by ART)
- A route via the A9119 Queen's Road (B) would enable ART to then route via Carden Place / Albyn Place and the full length of Union Street
- Extending the ART route to Westhill would serve both the town and the large area of employment at Arnhall Business Park
- There was considered merit in testing both Kingswells P&R and Westhill as potential terminus points for ART. It was noted that a suitable terminus point in Westhill would be required (to turn vehicles and provide driver layover) and a suitable site (mobility hub) for parking to join the ART service.
- It was noted in the longer term, that a terminus at Westhill (with an associated P&R site) could call into potential question the for the Kingswells P&R site
- The unintended consequences to bus services operating from beyond Westhill into Aberdeen needed to be understood to ensure there was no loss of service from the more rural communities (i.e. due to the potential for lost passengers to ART over the Westhill to city centre part of the services). It may be that such rural services could become feeder services into the ART network. This needs further explored with operators once a preferred ART network is determined.
- Reconfigured access and egress at Kingswells P&R would be needed to minimise the potential for a convoluted ART route into the site, although the demand generated by the business park at PrimeFour was recognised and consideration of effectively serving this development was needed. This was considered more pertinent if ART terminated at Westhill, as, for those joining the ART service at Westhill, a circuitous route into Kingswell P&R is likely to increase journey time and detract from the attractiveness of the ART service.

3.3.13 Consideration was also given to the potential routeing of the ART service on approach to the city centre *if a route along the A944 was preferred*. As shown in Figure 3:6, a number of potential routes into the city centre have been considered (drawing on information from the A944 / A9119 Multimodal corridor study). The routes include:

- Via Skene Square / Woolmanhill Skene Street / Rosemount Viaduct / Union Terrace to Union Street - similar to that noted above for the ART route in the north-west corridor (A)
- Via Skene Square / Denburn Road - similar to that noted above for the ART route in the north-west corridor (B)
- Via Hutcheon Street / Gallowgate / Broad Street (C)
- Via Hutcheon Street / West North Street (D)

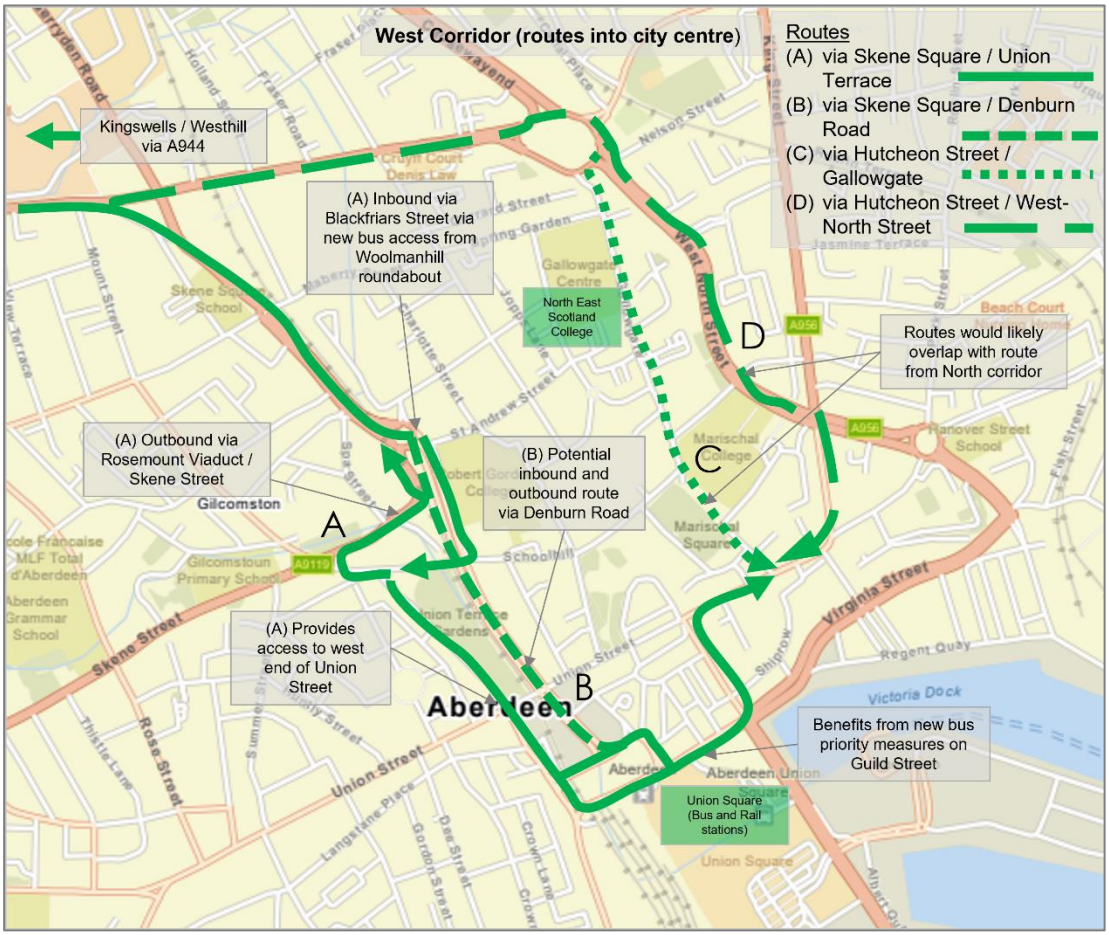


Figure 3:6: West Corridor Considerations – Routeing into city centre from A944

3.3.14 Through the officer workshop and bus operator discussions it was noted that:

- A route via Skene Square / Denburn Road (B) is similar to that noted above for the ART route in the north-west corridor, and with similar points noted as above
- A route via Hutcheon Street / Gallowgate / Broad Street or West North Street (C) would likely overlap with the ART route from the north-west and, depending on the cross-city routeing chosen, could potentially create a 'dog leg' route inbound via Gallowgate to route back northbound towards Bridge of Don or Craibstone P&R

South Corridor

3.3.15 Figure 3:7 shows the route and terminus points considered for the south corridor. This consist of:

- Terminating at a (new) Portlethen Mobility hub / or Portlethen, with routeing:
  - via Wellington Road / West Tullos / King George V Bridge / Holburn Street (A)
  - via Wellington Road / Menzies Road / Victoria Road / Market Street (B)
  - via the A92 (C)
- Terminating at Robert Gordon University with routeing via Holburn Street / Garthdee Road (D) – *note that this would not be at the expense of serving a (new) Portlethen*

Mobility hub / mobility hub or Portlethen, but as part of a cross-city service from another corridor

Figure 3:7: South Corridor Considerations

3.3.16 Through the officer workshop and bus operator discussions it was noted that, from a terminus at a new Portlethen Mobility hub:

- via Wellington Road / West Tullos / Holburn Street (A) would serve the west end of the city centre and provide direct access along the length of Union Street as well as serving Altens and West Tullos industrial estates. The constrained nature of Holburn Street requires consideration, (and is being considered through the Ellon to Garthdee study) to understand the level of bus priority that could be achieved along this section of the route. Compromise with potential active travel infrastructure on the route would likely lessen the benefits of ART if bus priority could not be provided in tandem

- via Wellington Road / Menzies Road / Victoria Road (B) would serve business sites including Altens and East Tullos industrial estates as well as Torry. The existing congestion on Wellington Road was noted along with an existing pinch point at Polwarth Road, which creates a constraint along the route. Access to the city centre would be via Market Street with the potential to either route straight up Market Street to Union Street or to serve the rail station via Guild Street and Bridge Street

- via the A92 (C), would mean a large section (around 4.5km) of the route between the edge of Aberdeen (at Kincorth) and the new Portlethen mobility hub would be through rural landscape with very limited trip attractors or generators, but with the associated operating cost

- There is potential to provide an ART depot at any new Portlethen mobility hub

- A terminus point for ART within Portlethen itself would be, to some extent, in competition with the rail service, detracting from the ART service / or causing abstraction from rail. For this reason, it was not considered for progressing further, although it may provide an interim solution prior to the development of a dedicated mobility hub.

3.3.17 From a terminus at Robert Gordon University:

- A route via Holburn Street (D), as noted above, is potentially constrained in the level of bus priority that can be achieved

- Would offer an existing strong bus market on which to build on the success through ART and the potential to connect the two Universities and associated student accommodation if linked to the north corridor. In this regard, it was noted by bus operators that ensuring ART served known existing strong bus markets was considered essential to providing the greatest chance of commercial success for the network

3.4 Routeing Tests

3.4.1 Given all the information gathered through the officer and operator discussions, 10 routeing tests were determined. A 'core' test was chosen from these, with each subsequent test changing just a single variable (route or terminus) from the core test. In this way, the impact of each test could be more easily compared.

3.4.2 The core test, and the nine subsequent tests are shown in the table and figures below, which also detail the interchange location assumptions (where the ART routes would cross) given the routeing and cross-city connectivity assumed. The orange text in the table below indicates what has changed in each test from the core test.

3.4.3 Note that based on the outcomes of the previous analysis undertaken on the ASAM matrices, a test where ART operates as four services interconnecting in the city centre is not considered further. The earlier analysis highlighted the poor performance of this in terms of estimated demand and revenue (due to the lack of new direct cross city connectivity).

Table 3:1: ART Routeing Tests

Test	ART Service Routes	Routeing	Purpose of Test
Core	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	N/A
A1	**North to West:** Bridge of Don P&R to Kingswells P&R	**North:** Ellon Road / King Street	Changed routeing at airport.

Test	ART Service Routes	Routeing	Purpose of Test
	North-West to South: Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North-West:** Changed routeing at airport. Outbound: TECA → airport → Craibstone P&R Inbound: Craibstone P&R → city centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Gauge comparative benefits of routeing inbound directly from Craibstone P&R site
A2	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Changed routeing at airport. Clockwise (every other service): city centre → TECA → airport → Craibstone P&R → city centre Anti-clockwise (every other service): city centre → Craibstone P&R → TECA → city centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Changed routeing at airport. Gauge comparative benefits of routeing both clockwise and anti-clockwise at Craibstone P&R / airport. Routeing would provide direct (and attractive) inbound routeing from P&R to city centre, as well as direct (and attractive) inbound routeing from Airport to city centre. Would enable trips from P&R to airport. Frequency of P&R to city centre *direct* service only every other ART service
B1	**North to West:** Cloverhill via Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing beyond Bridge of Don P&R to new housing development site (400 housing units assumed built out by 2030 and represented as such in ASAM19 2030 Do Min model)
B2	**North to West:** Blackdog and Cloverhill via Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing beyond Bridge of Don P&R to the Blackdog development site (580 housing units built out by 2030 and represented as such in ASAM19 2030 Do Min model)
C1	**North to West:** Bridge of Don P&R to Westhill	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing	Gauge benefits of extending western corridor to Westhill rather than Kingswells P&R

Test	ART Service Routes	Routeing	Purpose of Test
	North-West to South: Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	(both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	
C2	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A9119 (Queen's Road / Skene Road) / A944 **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing via A9119 instead of via A944 between city centre and A9119/A944 junction
D	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Holburn Street / Great Southern Road / West Tullos Road / Wellington Road	Gauge benefits of routeing south via Holburn Street / Great Southern Road / West Tullos Road / Wellington Road
E	**North-West to West:** Craibstone P&R (via airport and TECA) to Kingswells P&R **North to South:** Bridge of Don P&R to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	To gauge benefits of alternative combination of cross city services to compare to Core Test, i.e., NW-W and N-S Note: North to South provides direct routeing but North-West to West connection is far longer than straight line routeing (see mapping)
F	**North to South (RGU):** Bridge of Don P&R to Robert Gordon University **West to East (Beach):** Kingswell P&R to beach via Union Street **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen P&R / Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **East:** Justice Street / Beach Boulevard	To gauge benefits of alternative combination of cross city services to provide connectivity to RGU and Beach masterplan area as part of ART network

Test	ART Service Routes	Routeing	Purpose of Test
		South (Portlethen P&R): Market Street / Victoria Bridge / Wellington Road **South (RGU):** Holburn Street / Garthdee Road	

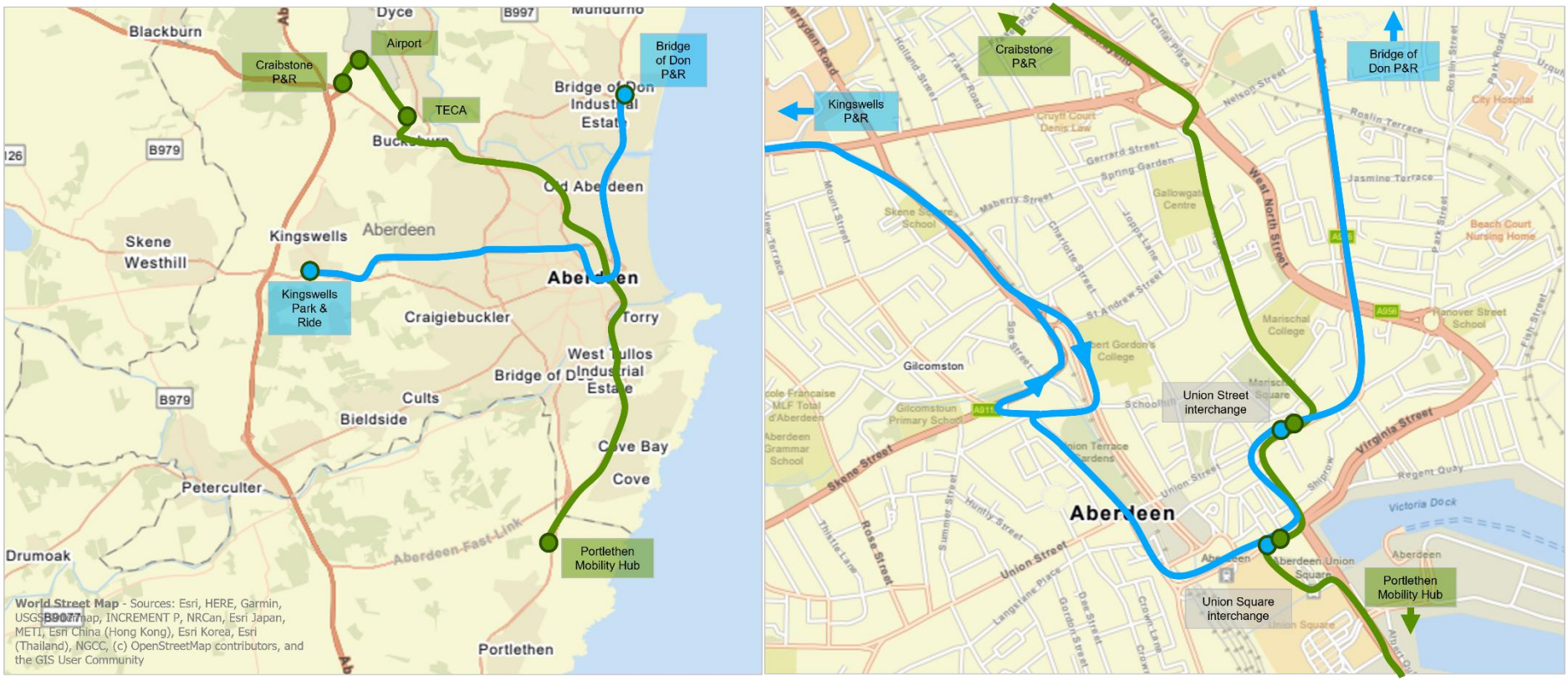


Figure 3:8: Core Test – Routeing and city centre interchange

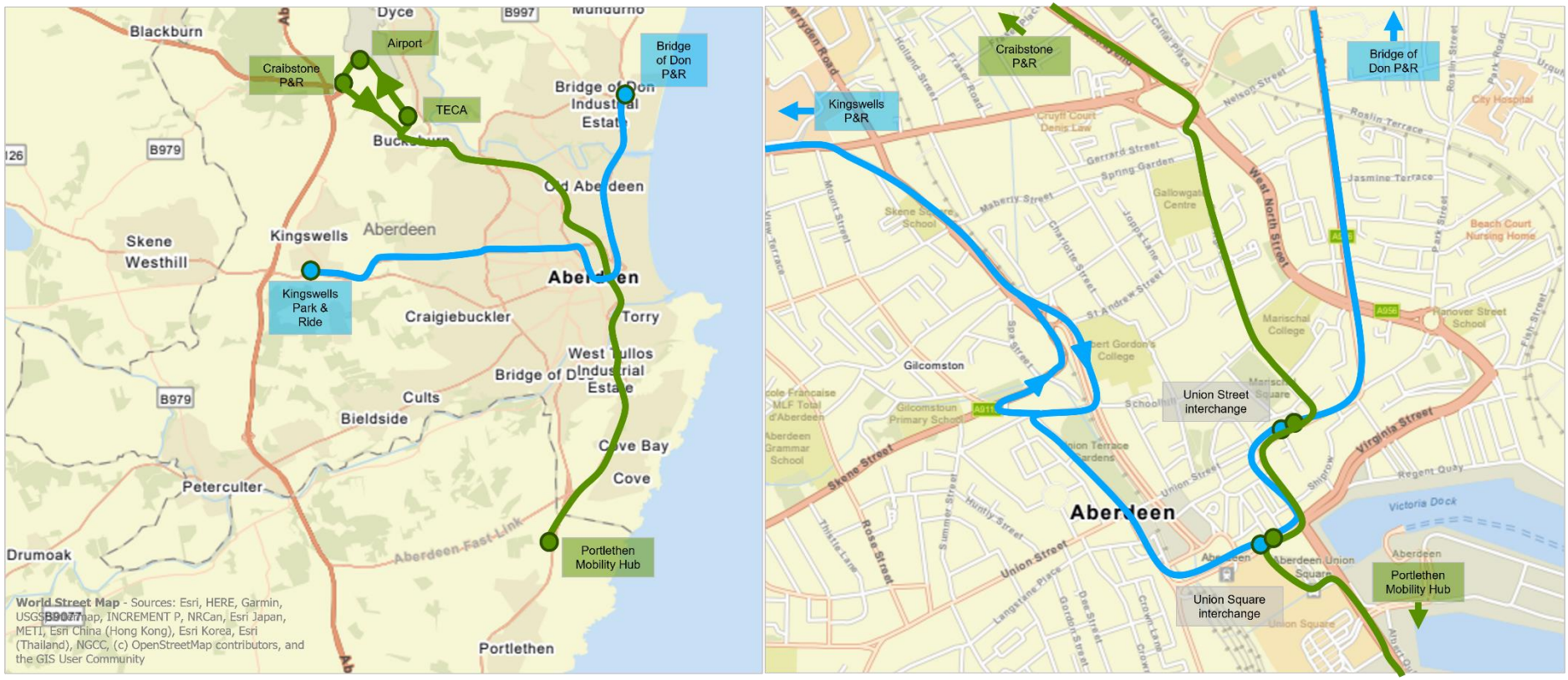


Figure 3:9: Test A1 – Routeing and city centre interchange - *Airport routeing*

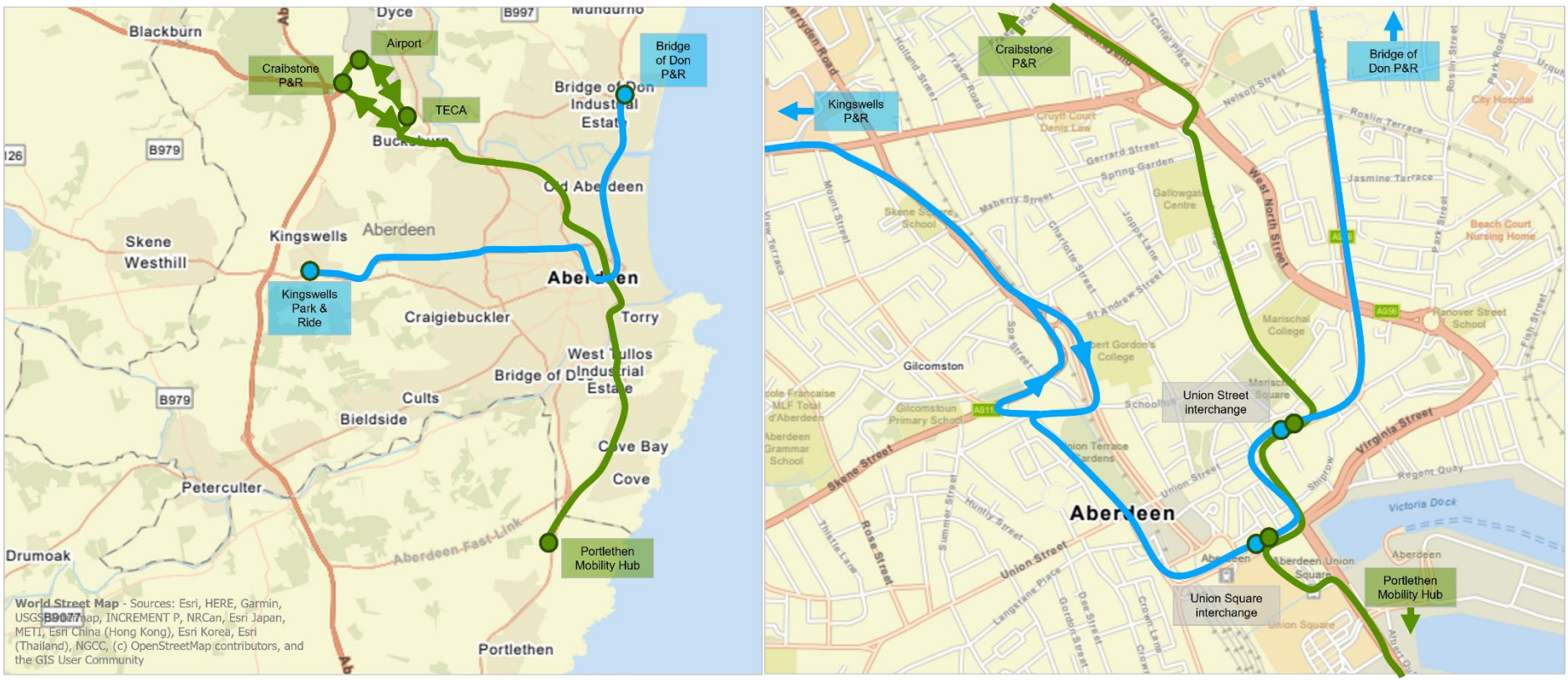


Figure 3:10: Test A2 – Routeing and city centre interchange - *Craibstone and Airport routeing (ART both clockwise and anti-clockwise at western terminus)*

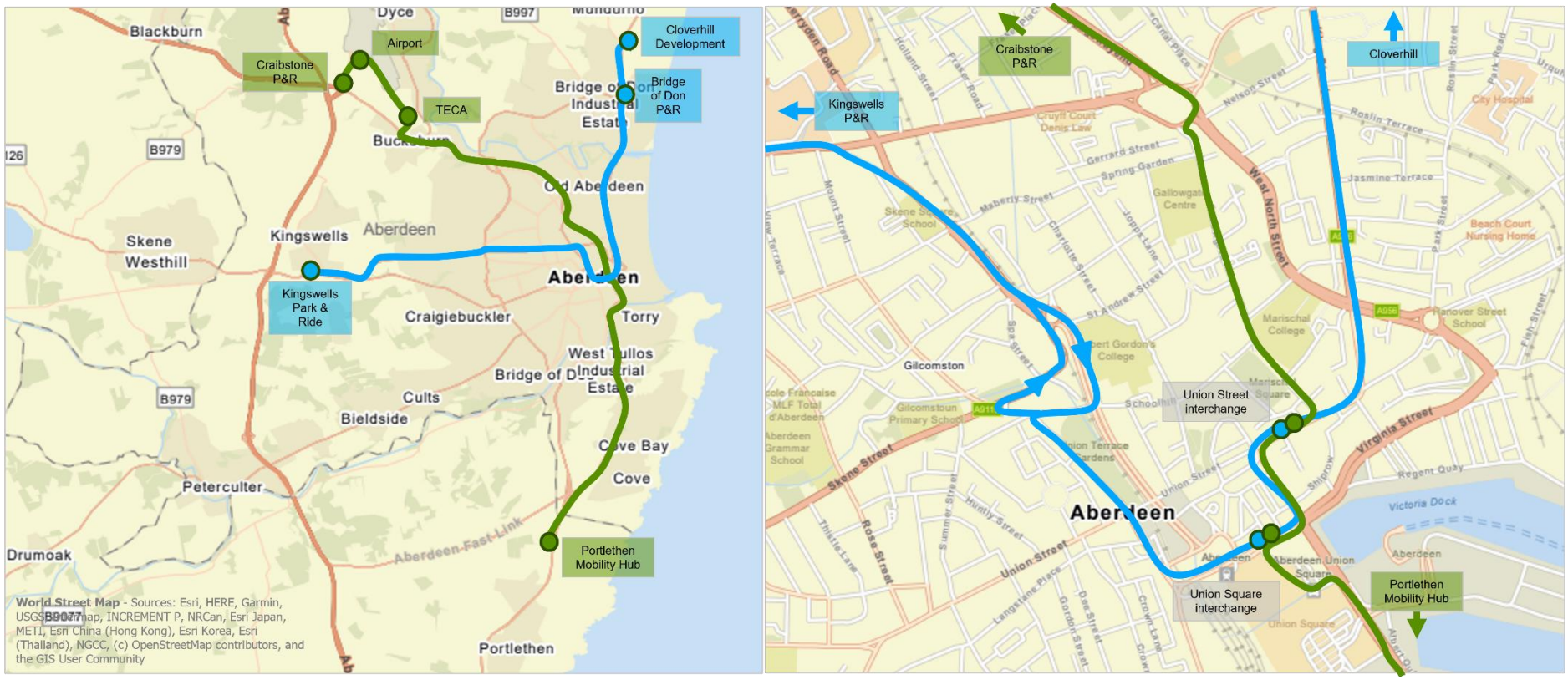


Figure 3:11: Test B1 – Routeing and city centre interchange - Cloverhill

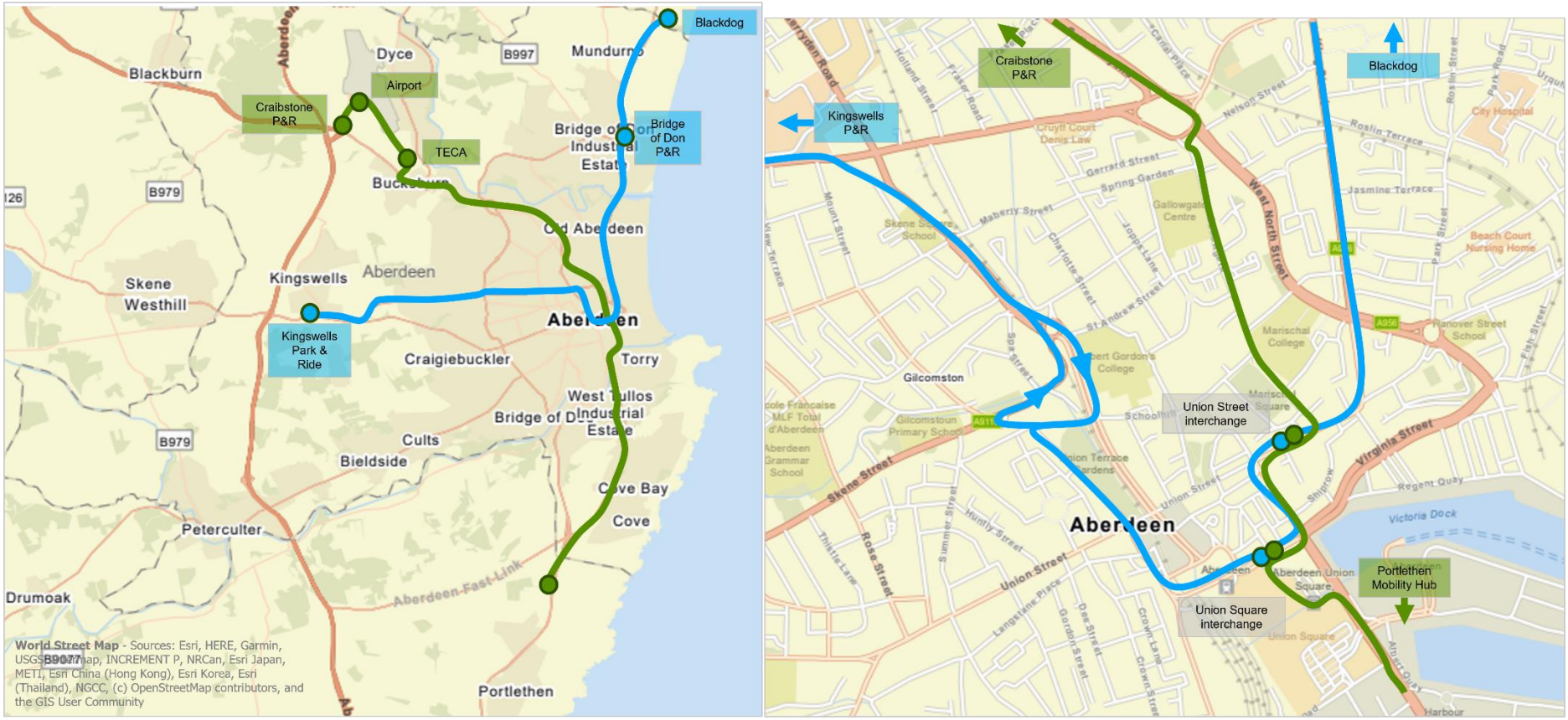


Figure 3:12: Test B2– Routeing and city centre interchange – Blackdog

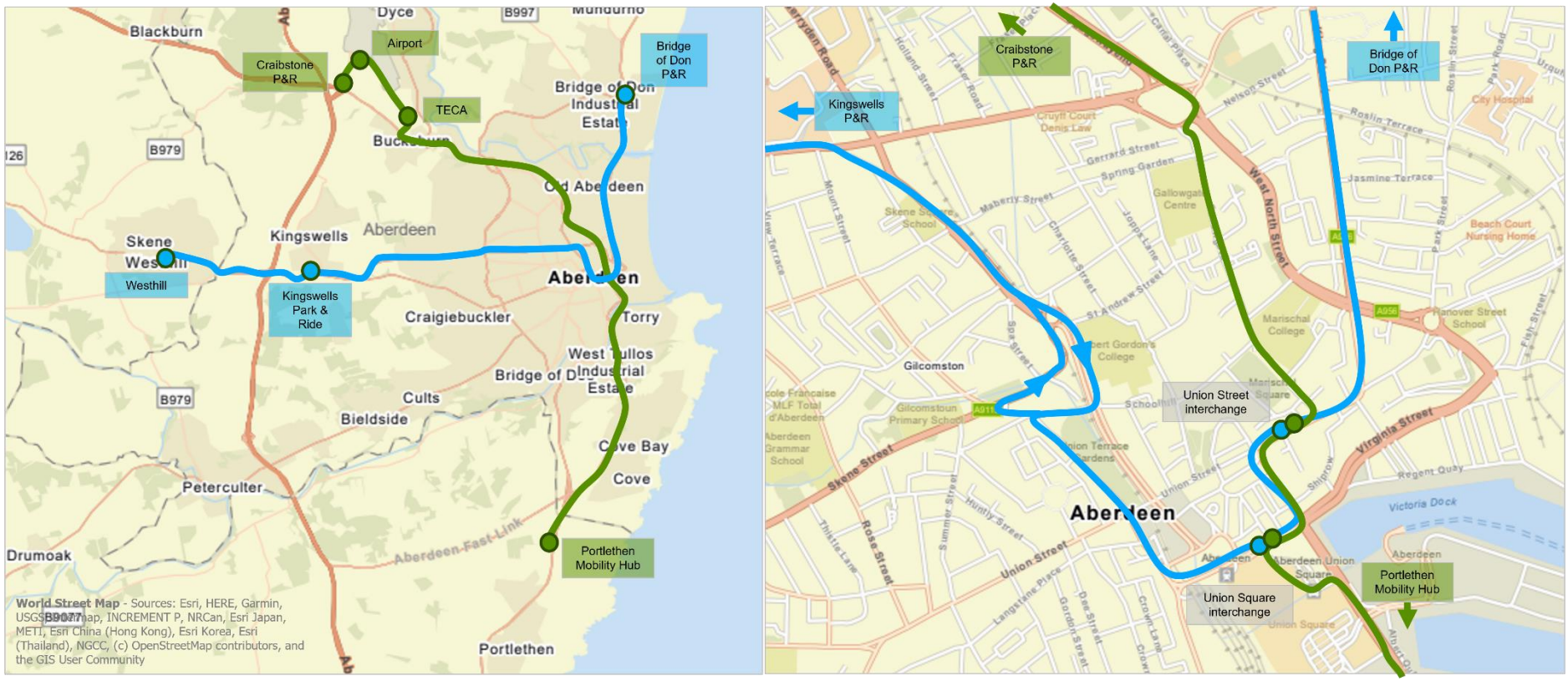


Figure 3:13: Test C1– Routeing and city centre interchange - Westhill

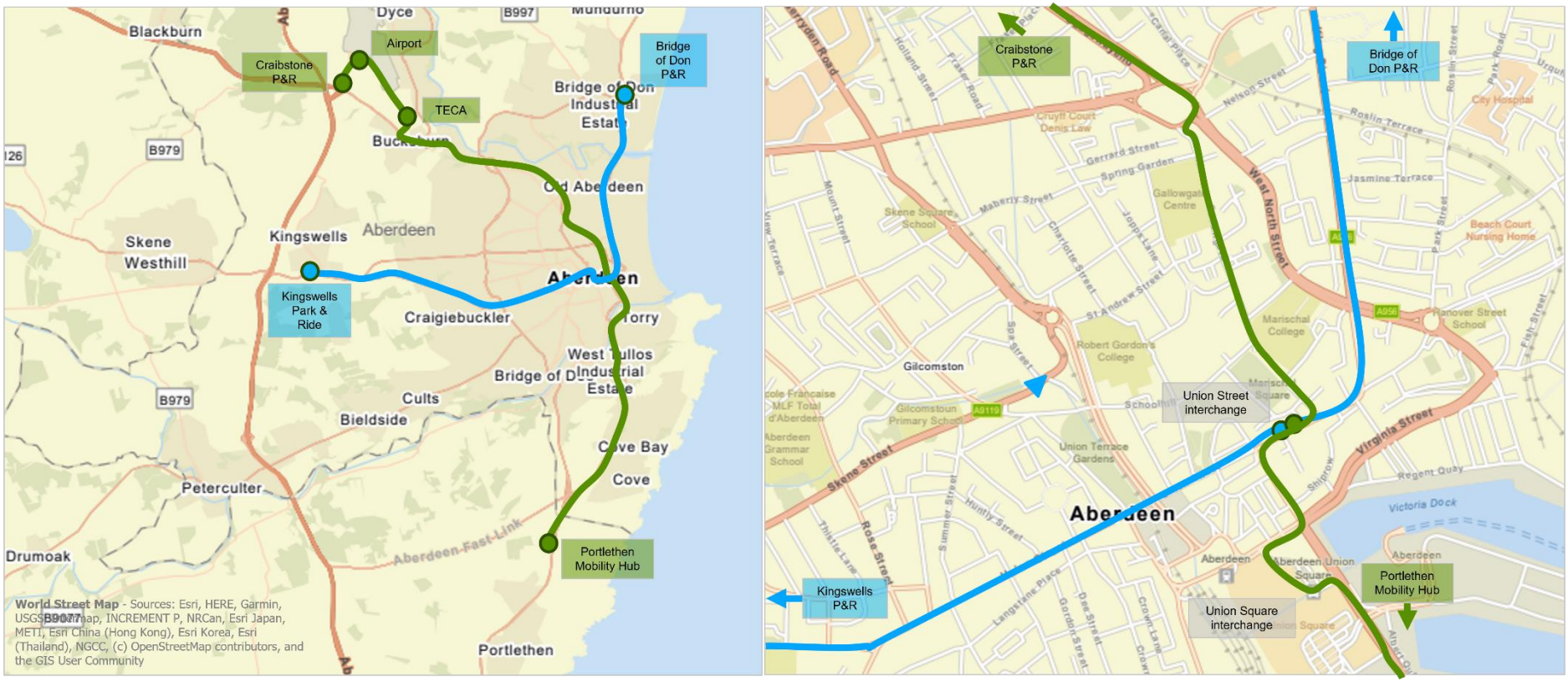


Figure 3:14: Test C2– Routeing and city centre interchange – A9119 Routeing

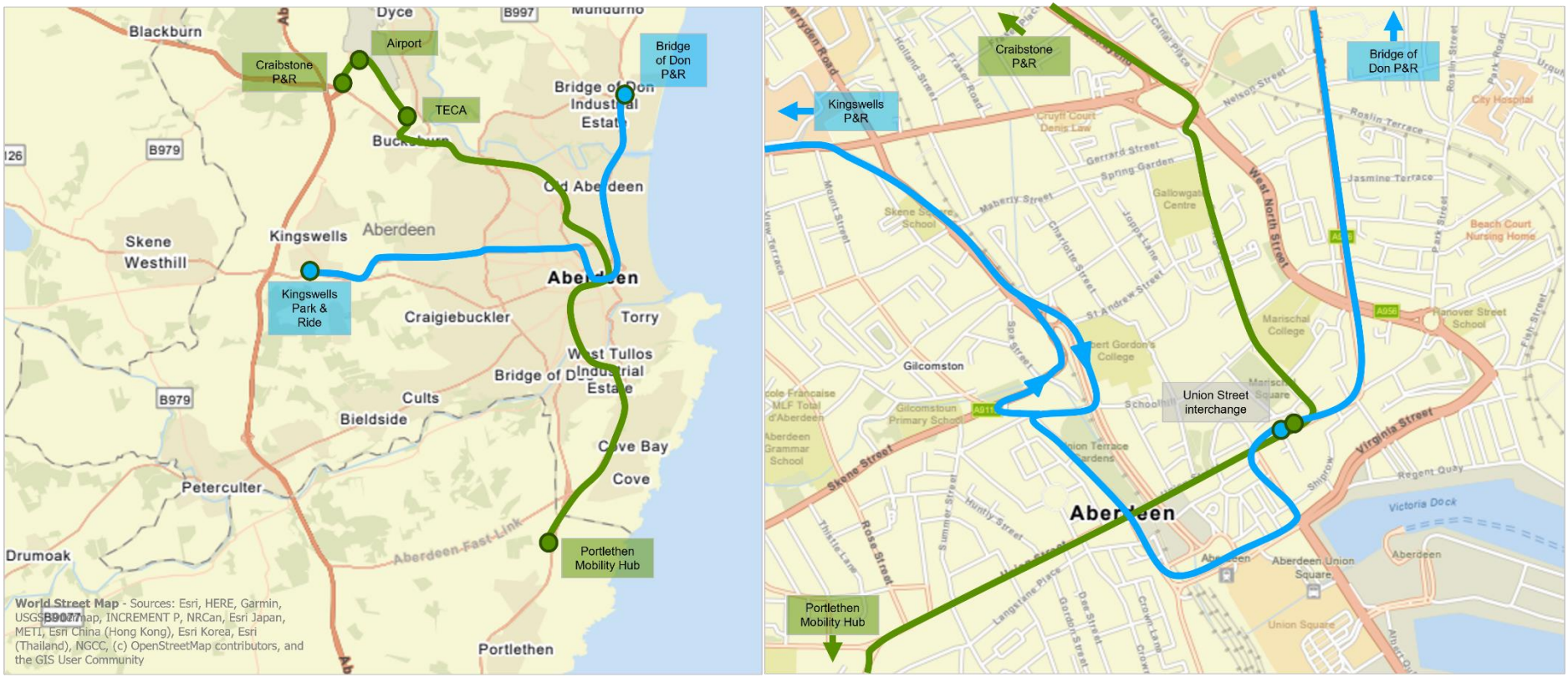


Figure 3:15: Test D – Routeing and city centre interchange – Routeing via Holburn Street / Great Southern Road / West Tullos Road / Wellington Road

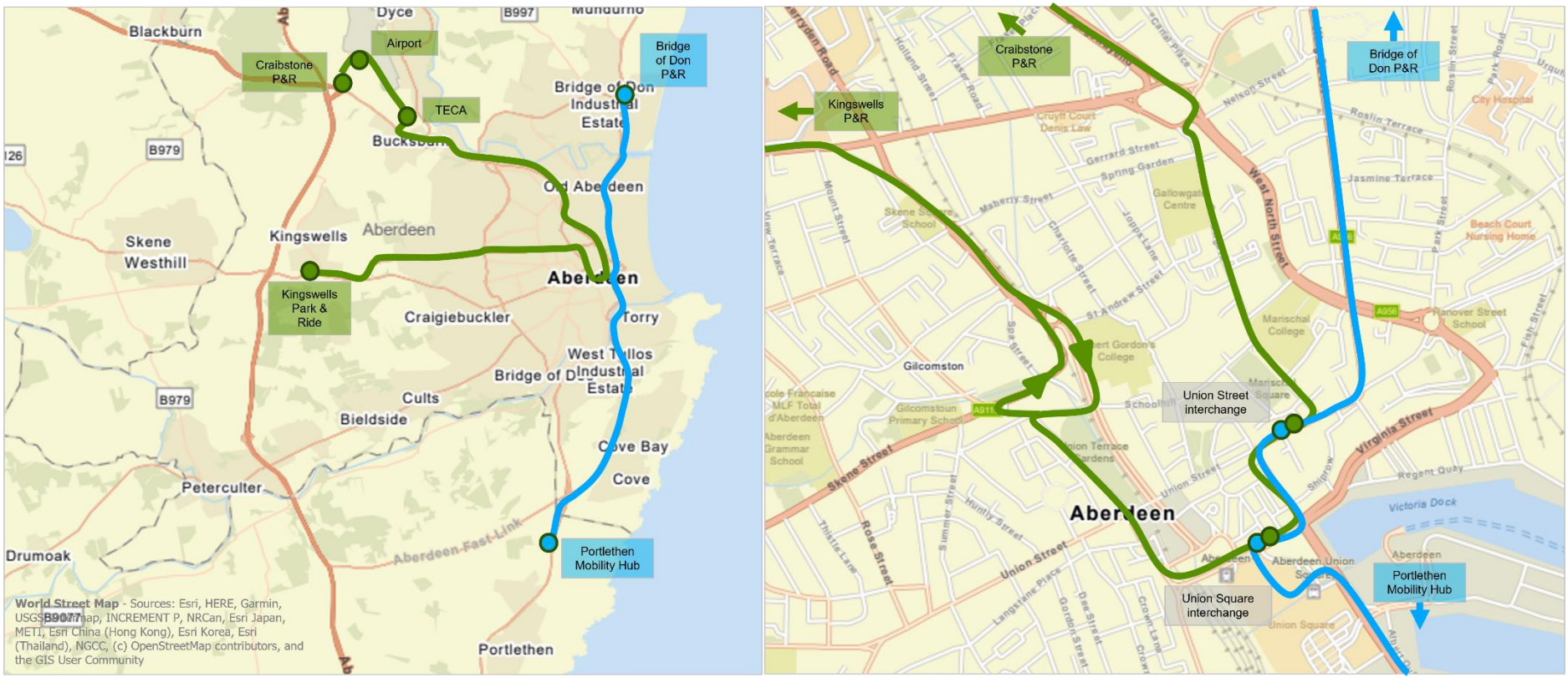


Figure 3:16: Test E – Routeing and city centre interchange – Changed cross-city connectivity

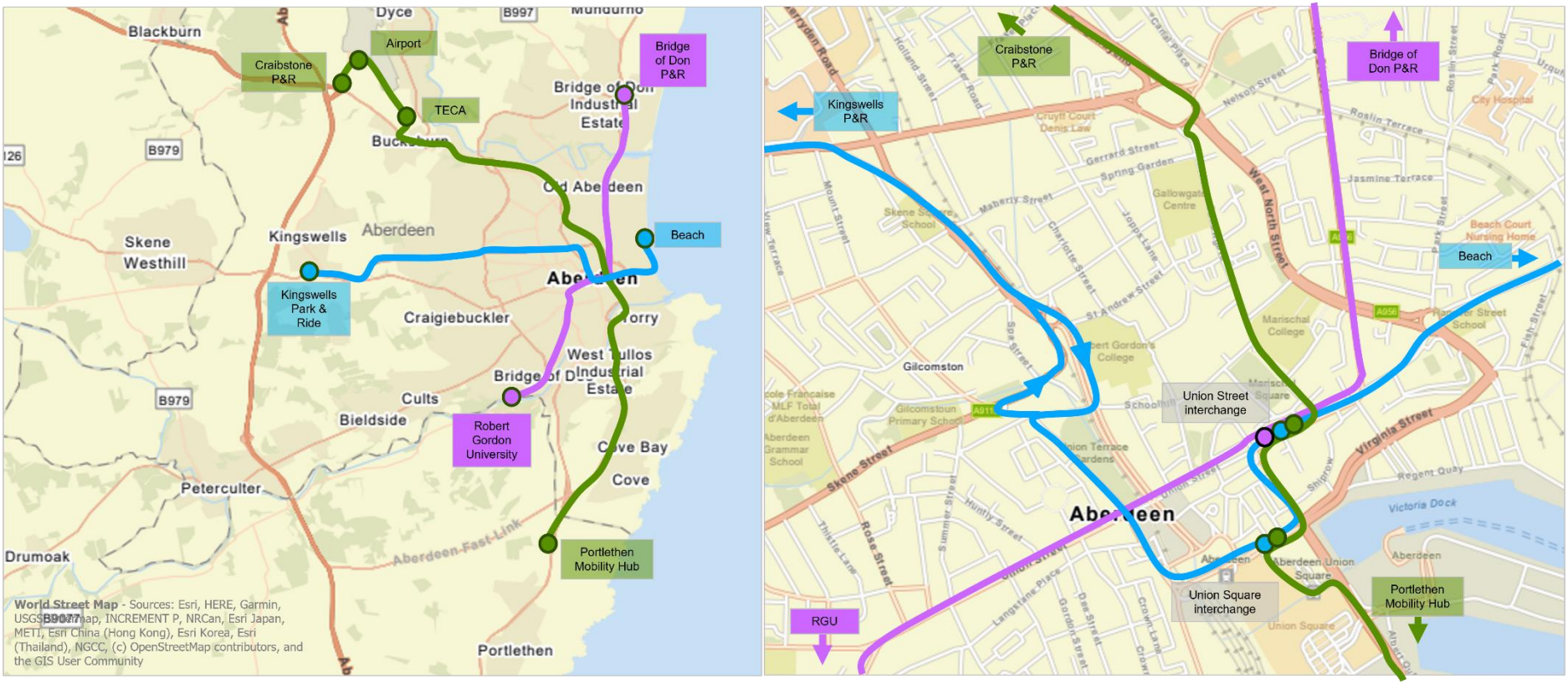


Figure 3:17: Test F– Routeing and city centre interchange – Three ART lines variant

3.5 Modelling and Assumptions

ASAM Model

3.5.1 The ASAM19 2030 'without policy' model scenario was chosen to test the options. Given ART is one of the mechanisms likely to support achieving a reduction in vehicle kilometres by 2030 (as set out in Scottish Government policy), it is deemed more appropriate to test the scheme in a scenario more closely aligned with a 'business as usual' future situation (as opposed to in the 2030 'with policy' scenario which reflects a future position where the 20% vehicle kilometre reduction has already been achieved).

Bus Priority Infrastructure Assumptions

3.5.2 Through discussion with the relevant corridor studies teams, the latest assumptions on the bus priority infrastructure along the corridors being considered in each test was coded into the ASAM19 model. The corridor studies have sought to design infrastructure to enable the success of ART (against its objectives) and therefore the infrastructure coded into the model presents, where possible, the greatest level of bus priority which could be achieved along each route, though both road space reallocation and junction / signal design. Note however, that at certain locations the available road space is challenging and compromise between bus priority and active travel has been required. Further consideration of the potential impact on ART as a result of this needs close consideration as the corridor studies progress. *Supporting Technical Note A: ART Routeing Analysis - Infrastructure Assumptions (Stantec, March 2024)* provides details of the infrastructure coded into the model for each corridor, which reflects the assumed infrastructure as of January 2024.

Underlying bus network integration

3.5.3 At the previous Detailed Options Appraisal stage of the study, it was recognised that ART will operate as a high frequency bus service along the ART corridors and as such will overlap with existing services. If ART is to be part of an integrated and efficient city-wide bus network, changes will be required to existing bus routes and services.

3.5.4 Similar to the process undertaken during the previous testing, for each of the routeing tests considered, a set of changes were made to the existing bus network based on the extent to which ART services overlap with the existing bus network, while seeking to maintain overall accessibility to the bus network across Aberdeen.

3.5.5 It should be noted that this exercise by no means seeks to establish the exact nature of any changes to the underlying bus services if ART were implemented as per any of the tests. The analysis here has helped establish an illustrative bus network model for the purposes of testing. The work has also fed into an understanding of the potential commercial implications across the tests to bus operations in terms of ensuring an efficient and more commercially viable bus network for Aberdeen and into Aberdeenshire. The more precise nature of changes that may be required to the existing network needs greater consideration as the ART project progresses, and once a preferred ART network has been agreed, and through in-depth and ongoing involvement from existing operators.

3.5.6 *Supporting Technical Note B: ART Routeing Analysis – Bus Network Changes (Stantec, March 2024)* provides details of the underlying bus network assumptions coded into the model for each test.

Service Headways

3.5.7 Given the outcomes of the previous spreadsheet-based testing at the Preliminary Options Appraisal stage of the study, for the purpose of comparing the routeing at this stage, ART service headways of 10 mins were assumed for ART services i.e., 6 buses per hour. This represents what can be termed a 'turn up a go' frequency.

Other Assumptions

3.5.8 Further modelling assumptions, similar to those assumed during the previous testing, were also applied including:

- Reduced ‘in-vehicle weighting’ on ART services (compared to existing bus services) - to reflect the higher quality of ART buses (weighting of 1.4 reduced to 1.2)
- Bus stop spacing altered with ‘platforms’ along the ART corridors spaced approximately 800m for ART services
- Bus stop dwell times reduced for ART services to reflect the faster alighting and boarding assumed through use of bespoke multi-door vehicles (25 seconds existing bus dwell time reduced to 17 seconds for ART services)
- Applying a First Aberdeen fare structure to ART services (i.e., it is not assumed to be a ‘premium’ product) with added distance/fare for outlying connections i.e., Westhill

4 Elected Members Engagement

4.1 Introduction

4.1.1 As noted in Chapter 2, a workshop was held with Aberdeen City Council and Aberdeenshire Council Elected Members to gain councillor feedback on the network and routes being considered. The workshop was held on March 8th 2024 at Aberdeenshire Council's Woodhill House offices. In total 20 elected members were in attendance, with 12 from Aberdeenshire Council and 8 from Aberdeen City Council.

4.1.2 At the workshop an overview of ART was given, explaining the aims of the scheme and the work done to date on the project. A discussion around the corridors, framed as set out above by corridor in Chapter 3. Elected Members were then invited to move around four corridor 'stations' manned by members of the Stantec project team, and Nestrans and council officers. Each station had available large maps of the relevant corridor and post-it notes for providing general and location specific feedback.

4.1.3 Elected member were asked to consider five core questions in relation to each corridor and the network overall:

- What are the key destinations that ART needs to serve and does this point us to any preferred routes or key interchange points?
- Should one ART service run along the length of Union Street?
- Should connecting the Beach and Robert Gordon University be brought into the wider ART vision?
- What are your views on terminus points for each corridor?
- What are your views on the priority corridors for delivery?

4.2 Workshop Feedback

4.2.1 Feedback in relation to each corridor, and then more general comments are presented in the table below.

Table 4:1: Elected Member Workshop Feedback

Corridor / Network	Comment
North	Further discussion was needed with local councillors on Blackdog as a terminus point
	Cloverhill should be served by ART, noting the social housing being developed at the site
	The route from the north should connect through to Robert Gordon University (connecting the two university sites)
	Connections from the north to Foresterhill Health Campus considered very important
	Concerns about the capacity of King Street if roadspace reallocated to enable bus priority measures
	The Aberdeen Health Village as a key destination on the corridor was noted
North-West	A terminus (P&R) on the A947 (as opposed to Craibstone) should be considered
	Questions around the timeframe for delivery of the Berryden Corridor Improvement Project as well as the impact on existing housing – therefore impacting on routeing decisions for the corridor

Corridor / Network	Comment
	The need to utilise the Craibstone P&R 'white elephant' asset
West	The need for a stop in between Kingswell P&R and Westhill
	ART should extend to Westhill
	The need for ART to serve the Cormack Park training ground (i.e. with an ART stop at the ground)
South	The role of Chapelton Park & Choose site (near Newtonhill) within the ART scheme
	The large population of Portlethen that would not be served if ART terminated at the proposed Mobility hub to the north
	Concern around how ART would impact on the existing Stonehaven to Aberdeen service, and on Portlethen to Aberdeen services
	A need to consider the relationship of ART with events at Cove Football Club Ground, and the post office issue
	Support for a route via Wellington Road
	The importance of a connection from Kincorth to the Foresterhil health Campus
Network wide	Concern that terminating ART at P&R sites would encourage people to drive to the sites and increase car use for part of trips
	Important to have services outwith traditional bus peak times, to support the night time economy and shift workers, including the need for early and late services and at weekend operation
	There is a need for on-bus staff (not the driver) to support those with mobility issues etc. and to ensure safety and security, especially given the much larger vehicles
	The infrastructure design needs to take account of active travel and how bus and cycle tracks are integrated, with cycle tracks behind bus stops
	The need for good integration with the active travel network and active travel infrastructure at P&R sites
	Concern over passenger demand for ART and how it would impact on existing bus services, especially rural services
	Queries on whether the buses will be able to accommodate wheelchairs, luggage, bikes etc. especially if serving the airport
	The need to ensure the development of ART reflected on the changed travel patterns and reasons (post COVID)
	Concern over the existing bus station being too small to accommodate further vehicles, especially larger vehicles, and noting that Flix bus had recently been denied access
	The benefit of improved bus services for deprived areas

5 Testing Outcomes

5.1 Introduction

5.1.1 A range of model outputs were compared for the 10 tests and are set out below. This includes consideration of public transport journey times and speeds, modal shift, P&R usage, public transport passenger flows and general road traffic journey times, speeds and flow changes.

5.1.2 The analysis is presented below by corridor, with the relevant tests for the respective corridors compared. A final summary across all the tests is then presented and includes a high-level assessment of network 'viability'.

5.2 Caveats

5.2.1 There are a number of important factors to be borne in mind when considering the outcomes below:

- The infrastructure assumed in the testing was taken from the latest position with regards to each corridor study. In some cases the decisions made have required compromise between active travel and bus infrastructure. In some cases, the infrastructure assumed has prioritised active travel over bus given the available road space, and in doing so has increased congestion in which buses are also held up. **This interaction between the two modes will need careful consideration as the multi-modal studies and ART progress to ensure the benefits of ART can be fully realised, while providing attractive and viable routes for active travel**. In constrained areas, difficult and challenging decisions will be required.

- Assumptions were made under each test as to the type of changes that would be made to the underlying bus network, recognising that if ART is to be part of an integrated and efficient city-wide bus network, changes will be required to existing bus routes and services to minimise the duplication of services and associated operating costs and 'bus congestion', while maximising the potential for a commercially viable ART network. The changes assumed in the testing were by no means definitive and abstraction from the existing network to ART is sensitive to the changes made in the underlying network. Detailed discussion including with bus operators will be required to understand how, where and to what extent such changes are likely to be required. Given this, **focussing on absolute passenger demand data is not appropriate** at this stage. In the testing undertaken to inform the routeing it is noted that abstraction from the underlying network and ART demand generated a broadly neutral impact on passenger boardings (it is also worth noting that ART cross city services will reduce passengers 'boardings' to some extent by removing the need for some interchanges), another reason comparing passenger boarding data is not wholly appropriate here.

- The ART Detailed Options Appraisal demonstrated that the scheme benefits are significantly increased with the inclusion of demand management measures. The routeing testing undertaken here has not accounted for any such measures e.g. associated parking policy changes or neighbourhood mitigation required to fully realise the benefits of ART and minimise any negative impacts from traffic re-routeing due to the proposals. Such measures would increase the benefits of ART in terms of modal shift, and the results as presented here should be viewed as 'overly optimistic' for general road traffic (i.e., journey times are likely to be longer and traffic speeds lower).

5.3 Network Wide Overview – Core Test

5.3.1 Individual images comparing the changes in bus passenger flow and general road traffic flow between the core and relevant tests are presented for the corridors below. Overview graphics of the changes in passenger and general road traffic flow between the Reference Case (the

future year model serving as a baseline scenario against which the test scenarios and the Core Test are compared) are shown in the figures below. The ('without policy') Reference Case includes assumptions relating to traffic growth as well as development build out and committed transport schemes.

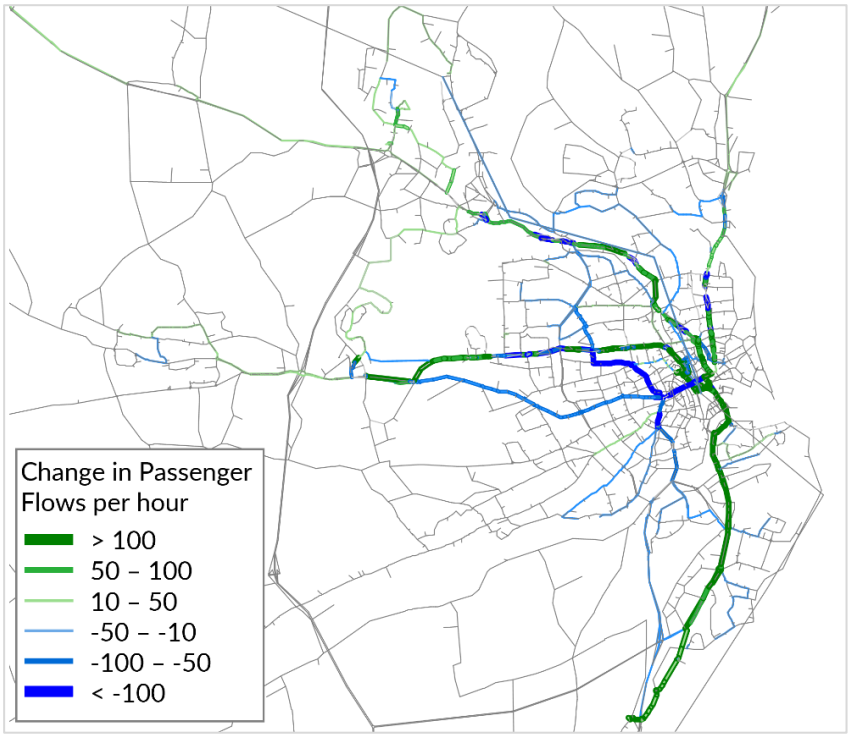


Figure 5:1: Passenger Flow Changes (AM Peak Hour) – Reference Case vs Core Test

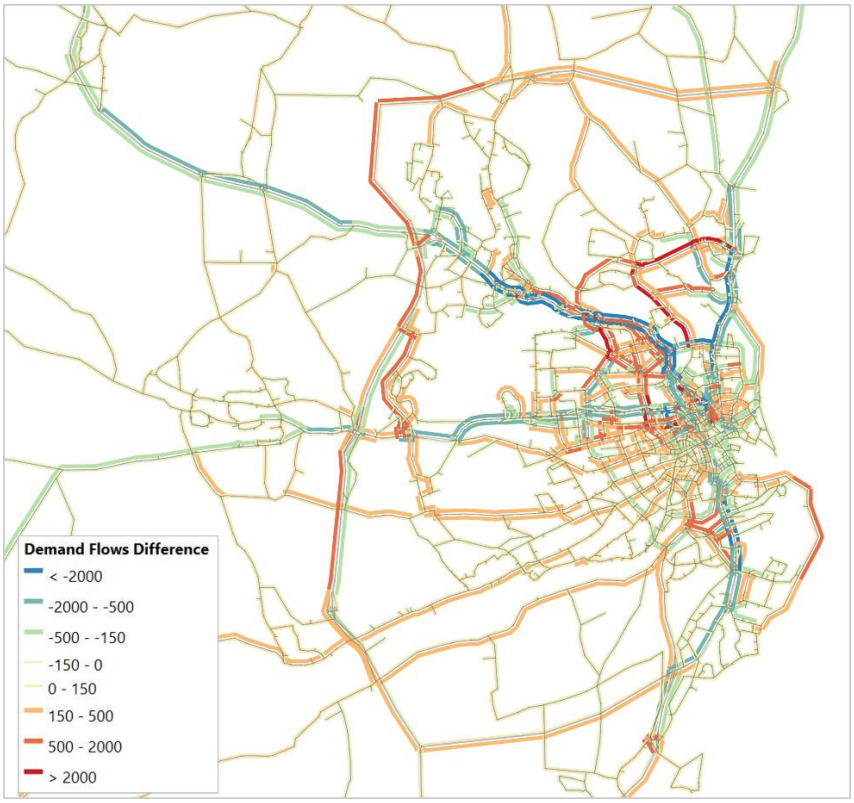


Figure 5:2: Road Demand Flow Changes (AADT) – Reference Case vs Core Test

5.3.2 The images show the increase in passengers on the ART corridors and the extensive rerouting occurring as a result of the roadspace reallocation proposals – again note that mitigation to minimise any negative impacts from traffic re-routeing as a result of the ART proposals has not yet been developed or modelled.

5.3.3 Such mitigation would be required to minimise the amount of traffic (i.e., 'through-traffic' or 'rat-running' traffic) using the streets within residential neighbourhoods to get to another destination. Mitigation may include traffic calming measures, locations where access is restricted to bus and cycle only, or cycle only, and would need to be developed and applied consistently across the city to maximise driver understanding. Note that local access and access for emergency vehicles would be maintained.

5.3.4 Mitigation to prevent unwanted routeing would not only minimise potential scheme impacts on residential neighbourhoods, but by not allowing such routeing to occur, is likely to increase congestion on the strategic routes (in the short term), making ART more attractive compared to the car.

5.3.5 It is recognised however, that even with such mitigation in place, there is still likely to be a level of unwanted wider routeing impacts on the road network.

5.4 Corridor Analysis Overview

5.4.1 The following sections present similar analysis undertaken for each of the four corridors. This includes analysis of:

- **Changes in travel time by public transport** between pertinent origin and destination pairs for each corridor, for both the AM and PM periods. For public transport the travel time represents the total journey travel time i.e. including access walk, wait, transit, interchange wait, egress walk

- **Changes in travel time for road traffic** between pertinent origin and destination pairs for each corridor (matching those used for public transport), for both the AM and PM periods. Unlike buses, general road traffic can re-route within the network between origin and destination pairs. Therefore, the impacts to general road traffic on the corridor itself due to the proposed road space reallocation for ART are not necessarily fully borne out in the general road traffic journey time. As noted above, ART should not be implemented without supporting mitigation to manage undesirable re-routing away from the corridor, but potential mitigation measures to manage these impacts this have not been developed or modelled at this stage. With such measures, it can be surmised that general road traffic journey times would be more greatly impacted than is shown in the results. To provide an indication of traffic re-routeing, the average distance travelled between the origins and destinations is also presented.

- **Modal Shift** across two cordons, an 'inner' cordon and a 'mid cordon, as shown in the figure below.

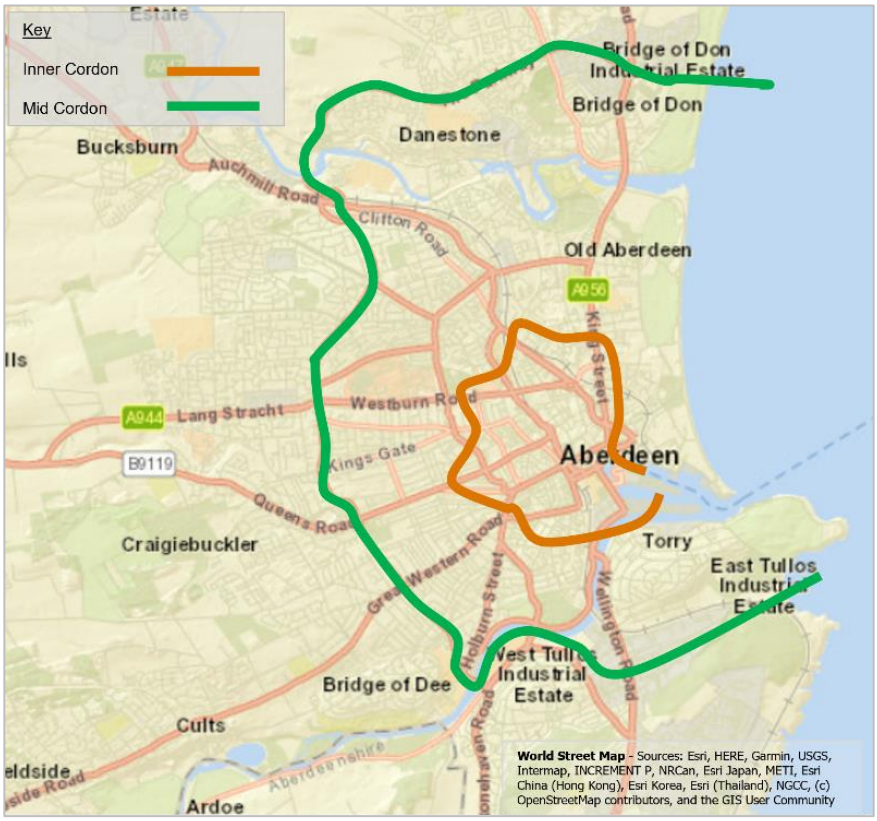


Figure 5:3: Inner, Mid and ART Cordon locations

- **Passenger and Road Traffic Flow Changes** to present a visual representation of where flows are changing across the modelled area – comparing the Core Test and the other tests relevant to each corridor

- **Changes in P&R / Mobility Hub Usage** – indexed to Reference Case usage

5.5 North Corridor

5.5.1 The analysis for the north corridor as presented below considers the Core test, and Tests B1 and B2 as shown below.

Figure 5:4: North Corridor Tests (Core, B1 and B2)

Journey Times

5.5.2 Changes in public transport travel time between origins and destinations to/from the northern corridor are shown in Table 5:1. General road traffic travel times between the same origins and destinations as used for public transport (as discussed above) are presented in Table 5:2

5.5.3 The results show very different impacts in the AM and PM periods. It is important to note in relation to the north corridor that the latest position with regards to infrastructure being developed through the Ellon to Garthdee study was coded into the model. At the time, the 'preferred' option was a '*Parallel Routes'* option (see Ellon P&R to Garthdee Transport Corridor Study Consultation - Aberdeen City Council - Citizen Space). This option (revised post consultation) sees the proposed 'parallel' active travel route between the junction of West North Street / Beach Boulevard and Kings Street / Seaton Place (south of the Bridge of Don), rejoin the King Street 'mainline' north of Seaton Place. On King Street north of Seaton Place, under these proposals the space required for the active travel route means no bus priority is north of Seaton Place. With the active travel proposals requiring road space reallocation to accommodate them, the road reduces to a single traffic lane in both directions, and buses are in this lane along with general road traffic. Therefore, buses are subject to any congestion caused. As noted below, this impact is felt in the PM period, when the network is much busier.

Table 5:1: Travel time – Bus (North Corridor Tests)

Time Period	Origin Zone	Destination Zone	Travel Time (access walk, wait, transit, interchange wait, egress walk)						
			Time (mins)				% change from Reference Case		
			Reference Case	Core - Bridge of Don P&R	B1 - Cloverhill	B2 - Blackdog	Core - Bridge of Don P&R	B1 - Cloverhill	B2 - Blackdog
AM	Bridge of Don P&R	Union Street	39	30	30	30	-21%	-21%	-21%
	Cloverhill	Union Street	37	34	31	31	-8%	-15%	-15%
	Blackdog	Union Street	57	55	55	39	-3%	-3%	-32%
	Ellon	Foresterhill Health Campus	86	78	77	76	-10%	-10%	-12%
	Ellon	Aberdeen Airport	102	92	92	92	-9%	-10%	-10%
PM	Union Street	Bridge of Don P&R	37	40	40	40	9%	9%	9%
	Union Street	Cloverhill	44	44	42	42	0%	-6%	-6%
	Union Street	Blackdog	55	64	64	50	16%	16%	-9%
	Foresterhill Health Campus	Ellon	86	87	87	86	1%	1%	0%
	Aberdeen Airport	Ellon	101	102	103	102	1%	2%	1%

Table 5:2: Travel time and distance– General road traffic (North Corridor Tests)

Time Period	Origin	Destination	Travel Time							Distance						
			Time (mins)				% change from Reference Case			Distance (km)				% change from Reference Case		
			Reference Case	Core - Bridge of Don P&R	B1 - Cloverhill	B2 - Blackdog	Core - Bridge of Don P&R	B1 - Cloverhill	B2 - Blackdog	Reference Case	Core - Bridge of Don P&R	B1 - Cloverhill	B2 - Blackdog	Core - Bridge of Don P&R	B1 - Cloverhill	B2 - Blackdog
AM	Bridge of Don P&R	Union Street	18	18	18	17	-1%	-1%	-1%	6.4	6.4	6.4	6.4	-1%	-1%	-1%
	Cloverhill	Union Street	18	18	18	18	0%	1%	1%	6.7	6.6	6.6	6.6	-1%	-1%	-1%
	Blackdog	Union Street	22	22	22	22	-1%	0%	-1%	11.3	11.2	11.2	11.2	-1%	-1%	0%
	Ellon	Foresterhill Health Campus	31	31	31	31	0%	0%	0%	28.0	27.9	27.9	28.0	0%	0%	0%
	Ellon	Aberdeen Airport	26	26	26	26	0%	0%	0%	33.7	33.7	33.7	33.7	0%	0%	0%
PM	Union Street	Bridge of Don P&R	18	27	26	27	45%	43%	44%	6.6	6.9	6.9	6.9	4%	5%	4%
	Union Street	Cloverhill	18	26	25	26	47%	45%	46%	6.3	6.5	6.6	6.5	4%	5%	4%
	Union Street	Blackdog	22	30	30	30	37%	35%	36%	10.4	10.6	10.7	10.6	3%	3%	2%
	Foresterhill Health Campus	Ellon	32	34	34	34	7%	7%	7%	26.8	29.7	29.7	29.6	11%	11%	10%
	Aberdeen Airport	Ellon	27	27	27	27	0%	0%	0%	33.7	33.7	33.7	33.7	0%	0%	0%

- In the **AM period**:
  - Significant reductions in public transport travel time for travel into the city centre, over 20% (9 minutes) quicker between Bridge of Don and Union Street
  - In Test B1 when ART terminates at Cloverhill, total travel time reduces by around 15% (6 minutes) between Cloverhill and Union Street
  - Comparing between tests shows accessibility improvements for those at Blackdog creating a much reduced overall journey time with total travel time (when ART terminates at Blackdog as in Test B2) to Union Street reduced by over 30% (18 minutes) i.e. benefits of having both the improved connection and the bus priority on the route
  - Reductions in travel time, under all tests, to both Foresterhill Health Campus and the airport (around 10% reduction (approximately 10 minutes) in travel time from Ellon)
- In the **PM period**, noting the above narrative with respect to the assumed infrastructure and increased congestion caused due to the proposed active travel infrastructure north of Seaton Place:
  - In the Core Test (terminating at Bridge of Don): overall bus travel time increases by 9% (3 minutes) between Bridge of Don and the city centre, whereas general road traffic travel times increase by 45% (9 minutes)
  - In Test B1 (terminating at Cloverhill): overall bus travel time reduces by 6% (2 minutes) between Cloverhill and the city centre, whereas general road traffic travel times increase by 45% (7 minutes)
  - In Test B2 (terminating at Blackdog): overall bus travel time reduces by 9% (5 minutes) between Blackdog and the city centre, whereas general road traffic travel times increase by 36% (8 minutes)
  - The results show that although the impact of the assumed infrastructure suggests a worsening of bus travel time, the bus priority assumed (south of Seaton Place) has ‘protected’ travel time by bus when compared to the car i.e. the increase in road traffic travel times are far greater than that seen for bus
  - In all the tests the distance travelled by general road traffic has increased, suggesting congestion is causing traffic to re-route, especially between Ellon and the Foresterhill Health Campus where the distance travelled increases by around 10% - note there is no distance change between Ellon and Aberdeen Airport as traffic will be using the Aberdeen Western Peripheral Route (AWPR) for this journey in both the Reference Case and tests.

Modal Shift

5.5.4 Bus passenger flow changes (12 hour flows) across the two cordons are presented in Table 5:3 alongside Figure 5:5 which presents passenger flow changes comparing the Tests B1 and B2 with the Core Test. Thereafter, Table 5:4 and Figure 5:6 present similar information for road traffic flow changes (12 hour flows).

Bus Passenger Flow Changes

Table 5:3:Bus Passenger 12-hour passenger flow across the cordons (North Corridor Tests)

Cordon	Direction	% difference from Ref Case		
		Core	B1	B2
Inner	In	6.2%	6.2%	7.7%
	Out	6.1%	6.2%	7.7%
	Tot	**6.2%**	**6.2%**	**7.7%**
Mid	In	13.7%	13.0%	15.6%
	Out	10.0%	9.5%	11.9%
	Tot	**11.9%**	**11.3%**	**13.8%**

5.5.5 Table 5:3 shows between a 6-8% increase in bus passenger flows across the inner cordon, and a 11-14% increase across the mid cordon. The greatest increase (14%) is seen under Test B2 where ART terminates at Blackdog. However, the results here need to be viewed in tandem with the P&R usage results (presented below). These results show that when ART extends to Blackdog, there is an erosion of usage at Ellon P&R site, suggesting more people are driving to Blackdog to access ART. It is approximately 17km from Ellon to Blackdog. So while the percentage mode share suggests an increased modal shift compared to the Core Test, it is likely that extending ART to Blackdog is actively increasing vehicle kilometres being driven while also impacting to some degree on the use of the Ellon P&R site itself.

5.5.6 The flow diagrams show:

- The limited impact of Test B1 when compared to the Core Test

5.5.7 The more significant change in passenger flows in Test B2, but again caveated as per the text above in relation to Ellon P&R and abstraction from the site

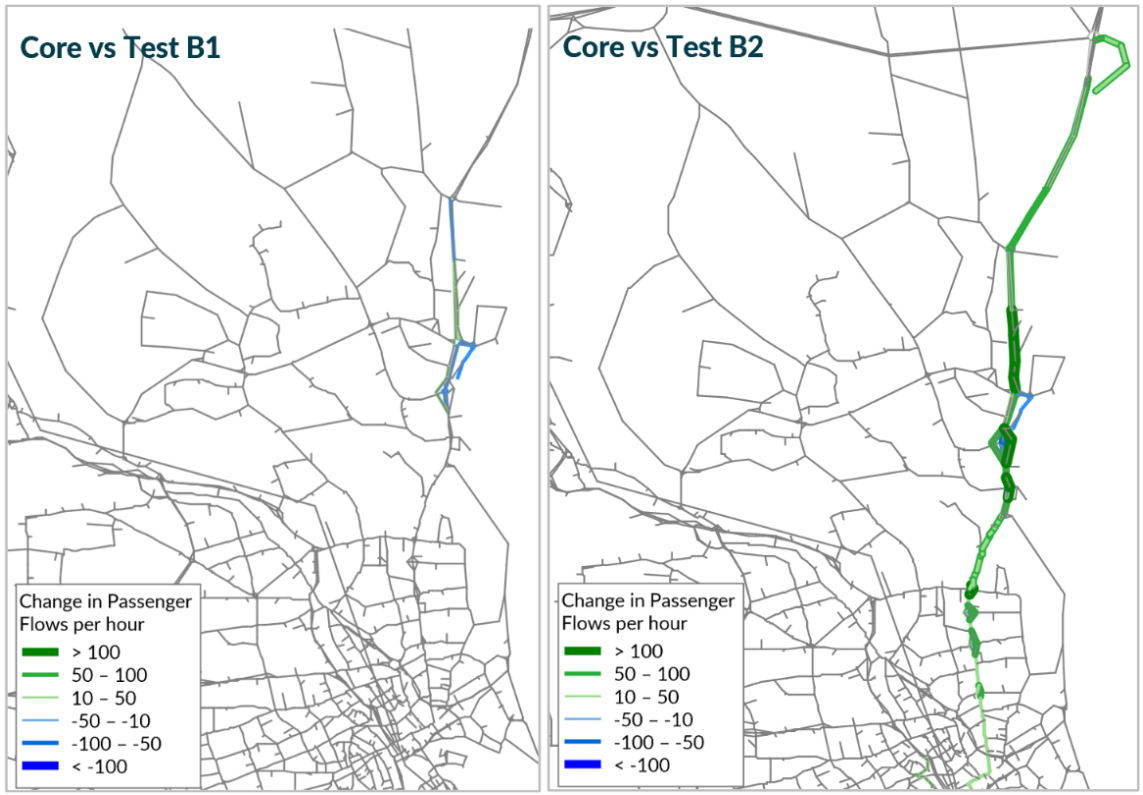


Figure 5:5: Passenger Flow Changes (AM Peak Hour) – Core Test vs Test B1 and B2

Road Traffic Flow Changes

Table 5:4: General road traffic 12-hour flow across the cordons (North Corridor Tests)

Cordon	Direction	% difference from Ref Case		
		Core	B1	B2
Inner	In	-2.6%	-2.4%	-2.8%
	Out	-1.4%	-1.2%	-1.5%
	Tot	-2.0%	-1.8%	-2.1%
Mid	In	-4.0%	-4.0%	-4.1%
	Out	-6.6%	-6.7%	-6.7%
	Tot	-5.3%	-5.3%	-5.4%

5.5.8 Table 5:4 shows a reduction in general road traffic of 2% across the inner cordon and 5% across the mid cordon, the figures being similar across the Core Test and Tests B1 and B2.

5.5.9 Firstly, it is clear from Figure 5:2 that re-routeing by general road traffic is occurring away from the Ellon Road / King Street route via the AWPR, The Parkway / North Anderson Drive and via Gordon Brae / Diamond Bridge. In addition, the B997 and the Esplanade are used. Again, as noted above, such re-routeing could be minimised by appropriate mitigation measures.

5.5.10 In terms of Tests B1 and B2 and their comparison to the Core test, when ART is extended to Cloverhill (Test B1) there is some additional traffic reduction between Blackdog and the Parkway. This is slightly more pronounced in Test B2, and the increase in traffic by those joining ART at the Blackdog terminus can also be seen.

Figure 5:6: Road Traffic Demand Flow Changes (AADT) –Core Test vs Test B1 and Test B2

P&R / Mobility Hub Usage

5.5.11 The overall demand across the full ART network for the tests considering changes in the northern corridor are shown in the table below, alongside details of the impact on P&R usage. It should be noted that the current Bridge of Don P&R site is not well served (indeed no services serve the site at the time of writing). Rather than present absolute usage figures, in order to focus on comparing the tests, Reference Case usage at the site has been indexed to 100.

Table 5:5: P&R Usage – average AM and inter-peak occupancy (North Corridor Tests)

Test	P&R Usage (indexed to Reference Case = 100)		
	Bridge of Don	Ellon	Total
Reference Case	*100*	*100*	*100*
Core (Bridge of Don P&R)	188	95	115
B1 – Cloverhill	123	95	101
B2 – Blackdog	129	85	94

5.5.12 The results suggest:

- Usage of the Bridge Don P&R site nearly doubles in the Core test compared to the Reference Case
- Terminating at Cloverhill does not generate significantly greater ART demand over and above serving Bridge of Don P& R site but does abstract users from Bridge of Don P&R site (i.e., the usage of Bridge of Don P&R site goes down compared to the Core test). There is some minor abstraction from Ellon P&R site.
- Terminating at Blackdog generates an additional 6% passenger demand on ART services compared to the core network where ART terminates at the Bridge of Don P&R site. However, this comes at the expense of usage of both Bridge of Don and Ellon P&R site and is likely to be, to a small degree, increasing vehicle kilometres by those now driving between Ellon and Blackdog. However, if the Bridge of Don site were repurposed, it could be assumed that the majority of demand at the site would shift to the Blackdog site – where a new Mobility Hub is assumed could be provided. Such a site would also reduce vehicle kilometres into Aberdeen by capturing demand from further out of the city. A smaller parking facility at Bridge of Don could be provided to cater for more localised demand, with access from such a site through to stops on the main carriageway.

North Corridor Summary

With ART in place, there are positive impacts on bus journey times, modal shift and P&R usage. The benefits of terminating ART further north of the Bridge of Don at Cloverhill are not clear, however extending further north to Blackdog shows greater benefit. If the Bridge of Don site were repurposed, it could be presumed that the majority of demand at the site would shift to the Blackdog site – where a new Mobility Hub is assumed could be provided. Such a site would also reduce vehicle kilometres into Aberdeen by capturing demand from further out of the city. For these reasons, terminating ART at a new Mobility Hub at Blackdog and repurposing the Bridge of Don P&R site is recommended. Early discussions with those developing the Blackdog site is recommended.

5.6 North-West Corridor

5.6.1 The analysis for the north-west corridor as presented here considers the Core test, and Tests A1 and A2 as shown below.

Figure 5:7: North-West Corridor Tests (Core, A1 and A2)

Journey Times and Speeds

5.6.2 Changes in public transport travel time between origins and destinations to/from the north-west corridor are shown in Table 5:6. General road traffic travel times between the same origins and destinations as used for public transport above are presented in Table 5:7, alongside distance data to enable an appreciation of traffic re-routeing.

Table 5:6: Travel time – Bus (North-West Corridor Tests)

Time Period	Origin	Destination	**Travel Time** (access walk, wait, transit, interchange wait, egress walk)						
			Time (mins)				**% change from Reference Case**		
			Reference Case	**Core TECA-Airport-Craibstone P&R**	**A1 - Craibstone P&R TECA-Airport-Craibstone P&R - City**	**A2 - Craibstone P&R (alternating loop)**	**Core – Craibstone P&R**	**A1 - Craibstone P&R (direct inbound)**	**A2 - Craibstone P&R (alternating)**
AM	Airport	Union Street	50	42	49	46	-17%	-2%	-8%
	Craibstone P&R	Union Street	55	43	36	40	-22%	-35%	-28%
	Inverurie	Foresterhill Health Campus	60	59	59	59	-2%	-2%	-3%
PM	Union Street	Airport	55	44	44	49	-20%	-19%	-10%
	Union Street	Craibstone P&R	58	46	46	43	-21%	-21%	-27%
	Foresterhill Health Campus	Inverurie	68	67	68	66	-1%	0%	-2%

5.6.3 The results show:

- Significant journey time reductions between the Craibstone P&R / airport and Union Street in all tests (between 12 and 19 minute reductions)
- Greater journey time reduction between Craibstone P&R and the city centre under Test A1 (with a 35% (19 minute) reduction compared to the Reference Case, and a 22% (12 minute) reduction under the Core Test), as the direct routeing from the P&R site into the city centre (i.e., not via the airport). In Test A2 where only every other ART service routes directly between Craibstone P&R and the city centre the journey time reduction is less at 28% (15 minutes) compared to the Reference Case.
- There are some minor journey time benefits in travel time between Inverurie and the Foresterhill Health Campus. It is worth noting that the rail service between Inverurie and the city centre is likely to be used for that part of the trip and hence the journey time will not be impacted by ART over that section.

Table 5:7: Travel time and distance – General Road Traffic (North-West Corridor Tests)

Time Period	Origin	Destination	Travel Time							Distance						
			Time (mins)				% change from Reference Case			Distance (km)				% change from Reference Case		
			Reference Case	Core – Craibstone P&R	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	Core – Craibstone P&R	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	Reference Case	Core – Craibstone P&R	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	Core – Craibstone P&R	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)
AM	Airport	Union Street	23	25	24	24	6%	5%	4%	11.2	11.2	11.2	11.2	0%	0%	0%
	Craibstone P&R	Union Street	24	25	25	25	2%	4%	3%	10.4	10.4	11.2	11.2	0%	8%	8%
	Inverurie	Foresterhill Health Campus	33	33	33	36	2%	1%	8%	25.3	25.3	24.2	25.6	0%	-4%	1%
PM	Union Street	Airport	25	29	29	31	17%	16%	23%	11.5	12.5	12.4	12.4	9%	8%	8%
	Union Street	Craibstone P&R	26	29	30	31	13%	15%	20%	10.7	11.7	11.7	13.5	9%	9%	26%
	Foresterhill Health Campus	Inverurie	34	35	36	37	4%	5%	9%	24.7	24.8	24.8	26.6	1%	1%	8%

5.6.4 The results show:

- General road traffic journey times increase, with the greatest increase noted of 23% between Union Street and the airport under Test A2. Note that this maximum journey time percentage increase only equates to approximately 6 minutes in additional travel time.
- Distance travelled between the airport / Craibstone P&R and the city centre also increases - generally around 8-9% under the Core and Tests A1 and A2 in the PM period, but up to 26% (around a 3km increase) in the PM in Test A2, indicating a degree of re-routeing.

Modal Shift

5.6.5 Bus passenger flow changes (12 hour flows) across the two cordons are presented in Table 5:8 alongside Figure 5:8 which presents passenger flow changes comparing the Tests A1 and A2 with the Core Test. Thereafter, Table 5:9 and Figure 5:9 present similar information for road traffic flow changes (12 hour flows). See Figure 5:1 for comparison of the Core Test to the Reference Case.

Bus Passenger Flow Changes

Table 5:8: Bus Passenger 12-hour passenger flow across the cordons (North-West Corridor Tests)

Cordon	Direction	% difference from Ref Case		
		Core – Craibstone P&R	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)
Inner	In	6.2%	6.1%	5.9%
	Out	6.1%	6.2%	6.1%
	Tot	**6.2%**	**6.2%**	**6.0%**
Mid	In	13.7%	13.6%	13.6%
	Out	10.0%	10.1%	10.1%
	Tot	**11.9%**	**11.9%**	**11.9%**

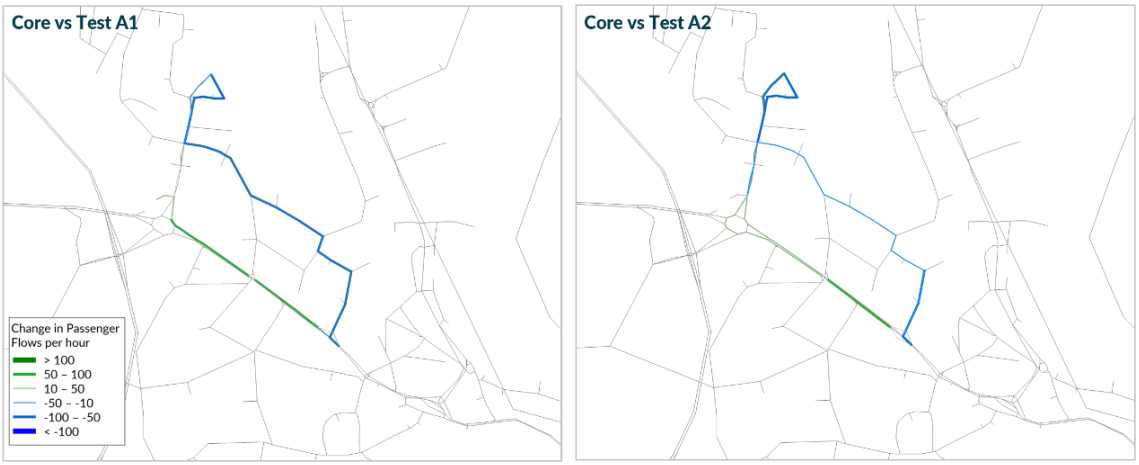


Figure 5:8: Passenger Flow Changes (AM Peak Hour) – Core Test vs Test A1 and A2

5.6.6 Note that the test variations between the Core Test and Tests A1 and A2 were undertaken to consider the journey time impacts of the alternative routeing around TECA, the airport and Craibstone P&R. As such, it was decided that Tests A1 and A2 would be run within ASAM as fixed assignment matrices (based on the Core Test Demand runs). Given this, the figures for Tests A1 and A2 reflect only a changed model assignment and for that reason are generally consistent with the Core test (with no demand modal shift reflected in the modelling).

5.6.7 The flow change diagrams show, as would be expected, a reduction in flow between the airport and TECA in both Tests A1 and A2 given the changed ART routeing, with the reduction greatest in Test A1 when the route from the airport into the city centre is via Craibstone P&R (and not TECA).

Road Traffic Flow Changes

Table 5:9: General road traffic 12-hour flow across the cordons (North-West Corridor Tests)

Cordon	Direction	% difference from Ref Case		
		Core – Craibstone P&R	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)
Inner	In	-2.6%	-2.8%	-3.0%
	Out	-1.4%	-1.6%	-1.8%
	Tot	**-2.0%**	**-2.2%**	**-2.4%**
Mid	In	-4.0%	-4.1%	-4.1%
	Out	-6.6%	-6.6%	-7.1%
	Tot	**-5.3%**	**-5.4%**	**-5.6%**

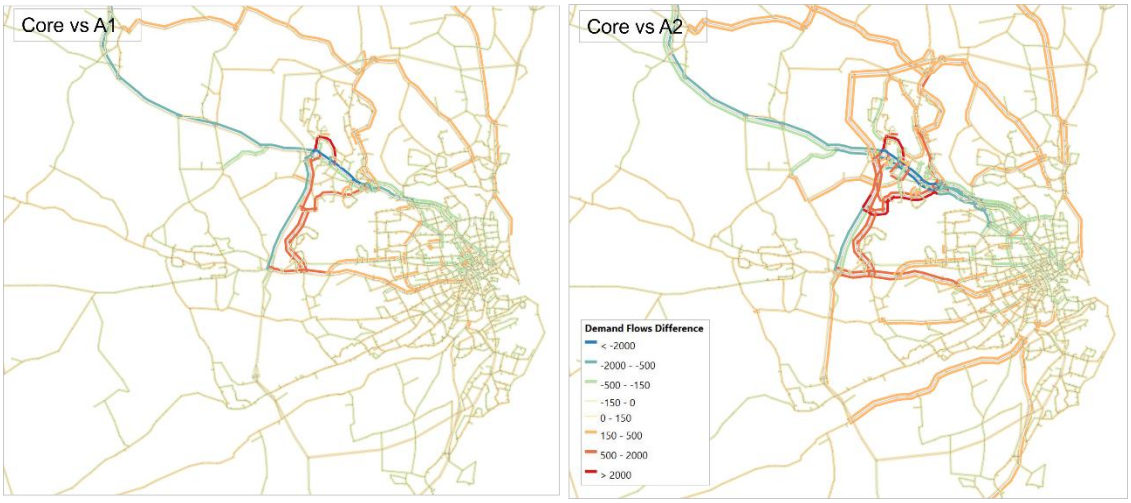


Figure 5:9: Road Traffic Demand Flow Changes (AADT) –Core Test vs Test A1 and Test A2

5.6.8 The figure shows traffic re-routeing changes in both Test A1 and A2 compared to the Core Test, with more pronounced changes in Test A2 with a considerable volume of traffic re-routeing through Kingswells and along both the A944 and A9119 (and on the A93 in Test A2). Note that the ART priority proposals at the A96 / Dyce Drive traffic signals for Tests A1 and A2 are causing this disruption within the road model network, due to the lower general traffic capacity available through this junction. These re-routeing impacts do appear quite severe within the modelling, but the general outcome suggests there are greater challenges in this area for general road traffic when reallocating roadspace towards bus priority (due to the high volumes of traffic). Further work is required through the A96 multi-modal corridor study to explore and identify an optimum solution at this location which balances bus priority with general traffic requirements.

P&R Usage

5.6.9 Details of the impact on usage at Craibstone P&R are presented below. Note that the variations between the Core Test and Tests A1 and A2 were undertaken primarily to consider the journey time impacts of the alternative routing around TECA, the airport and Craibstone P&R. As noted above, it was decided that Tests A1 and A2 would be run within ASAM as fixed assignment matrices (based on the Core demand). Given this, the P&R figures for Tests A1 and A2 are consistent with the Core test (and reported as such below).

Table 5:10: P&R Usage - average AM and inter-peak occupancy (North-West Corridor Tests)

Test	Craibstone P&R Usage (indexed to Reference Case = 100)
Reference Case	100
Core (and Tests A1 and A2)	246

5.6.10 The results suggest show more than a doubling of use at the P&R site with the proposals in place.

North-West Corridor Summary

The results show the positive impact on reducing bus journey times and increasing bus speeds across the tests, with the various tests impacting on journey time from Craibstone P&R and the airport, dependent on whether there is a direct connection into / out of Aberdeen from those locations under each test. There are clear journey time benefits to those joining the ART service at Craibstone P&R when the route into the city is not via the airport or TECA, but this is at the expense of both journey times for those connecting with those sites. In depth discussions with Aberdeen airport would be required to understand the potential benefits of ART to the airport as well as the impacts on both airport parking and parking revenue, to settle on a routeing pattern which considers and meets the needs of all potential ART users and destinations served. The analysis shows that the optimum route into the city centre, talking account of feedback from the bus operators, would be via the A96 / Great Northern Road, Powis Terrace / Place, Gallowgate and Broad Street to Union Street.

5.7 West Corridor

5.7.1 The analysis for the west corridor as presented here considers the Core test, and Tests C1 and C2 as shown below.

Figure 5:10: West Corridor Tests (Core, C1 and C2)

Journey Times and Speeds

5.7.2 Changes in public transport travel time between origins and destinations to/from the west corridor are shown in Table 5:11. General road traffic travel times between the same origins and destinations as used for public transport above are presented in Table 5:12 alongside distance data to enable an appreciation of traffic re-routeing.

Table 5:11: Travel time – Bus (West Corridor Tests)

Time Period	Origin	Destination	Travel Time (access walk, wait, transit, interchange wait, egress walk)						
			Time (mins)				% change from Reference Case		
			Reference Case	Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119
AM	Kingswells	Union Street	39	32	32	35	-19%	-19%	-12%
	Westhill	Union Street	56	57	45	57	1%	-21%	0%
	Westhill	Foresterhill Health Campus	63	43	37	63	-32%	-41%	-1%
	Westhill	Airport	72	60	60	60	-16%	-17%	-16%
PM	Union Street	Kingswells	40	34	34	35	-15%	-15%	-12%
	Union Street	Westhill	59	59	48	59	-1%	-19%	-1%
	Foresterhill Health Campus	Westhill	59	47	40	59	-21%	-34%	0%
	Airport	Westhill	103	62	61	62	-40%	-41%	-40%

5.7.3 The results show:

- More significant journey time benefits achieved with an ART service routeing along the A944 (Core Test) than the A9119 (Test C2). Between Kingswells and Union Street bus journey times reduce by 19% (7 minutes) in the AM when routeing along the A944, compared to a 12% (4 minutes) reduction when routeing down the A9119. In the PM, these figures are 15% (6 minutes) and 12% (5 minutes) respectively.

- There is a significant improvement in journey time for those in Westhill / joining ART in Westhill when ART is extended to the town (Test C1). The journey time by bus between Westhill and Union Street reduces by around 20% (11 minutes) in both the AM and PM periods (compared to limited change in the Core when, compared to the Reference Case, ART does not extend to Westhill - reflecting the fact that users are likely to remain on services routing via the A9119). Note that the significant journey time reduction between Westhill and the Airport has been gained through the inclusion of a new local service linking Westhill and Dyce, introduced to maintain local accessibility due to other underlying bus network changes made to integrate the ART proposals (see *Supporting Technical Note B).*

Table 5:12: Travel time and distance – General road traffic (West Corridor Tests)

Time Period	Origin	Destination	Travel Time							Distance						
			Time (mins)				% change from Reference Case			Distance (km)				% change from Reference Case		
			Reference Case	Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	Reference Case	Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119
AM	Kingswells	Union Street	20	22	21	21	8%	6%	3%	9.1	9.0	9.0	9.1	-1%	-1%	0%
	Westhill	Union Street	25	27	27	26	5%	8%	2%	12.3	12.0	12.2	12.1	-2%	-1%	-1%
	Westhill	Foresterhill Health Campus	19	21	21	19	8%	11%	1%	9.7	9.5	9.7	9.5	-2%	0%	-2%
	Westhill	Airport	14	14	14	14	1%	3%	1%	9.4	9.4	9.4	9.4	0%	0%	0%
PM	Union Street	Kingswells	21	23	23	22	9%	10%	8%	9.0	9.0	9.0	9.0	-1%	-1%	0%
	Union Street	Westhill	27	29	29	29	6%	5%	6%	12.3	12.3	12.3	12.4	0%	0%	0%
	Foresterhill Health Campus	Westhill	24	26	26	26	10%	9%	9%	10.3	10.9	10.9	10.9	6%	6%	6%
	Airport	Westhill	14	14	14	14	2%	2%	1%	9.8	9.8	9.8	9.8	0%	0%	0%

5.7.4 The results show, general road traffic journey times increase between all origin-destination pairs considered in the AM and PM periods, with journey times increasing by up to around 10% (although noting this only equates to an increase in journey time of around 2 minutes). Traffic re-routeing is clear between Westhill and Foresterhill Health Campus with a 6% (around 600m) increase in the distance travelled.

Modal Shift

5.7.5 For the modal shift analysis, as noted above for the North and North-West corridors two cordons have been considered. Bus passenger flows and general road traffic flows across the cordons are presented in Table 5:13 and Table 5:14 respectively. Alongside the tables, to provide an indication of the passenger flow and road traffic changes under each test, are figures showing the change in flow per hour in the AM peak, comparing the Core Test with Tests C1 and C2 (see Figure 5:1 for comparison of the Core Test to the Reference Case).

Bus Passenger Flow Changes

Table 5:13: Bus Passenger 12-hour passenger flow across the cordons (West Corridor Tests)

Cordon	Direction	% difference from Ref Case		
		Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119
Inner	In	6.2%	8.5%	4.4%
	Out	6.1%	8.4%	4.4%
	Tot	**6.2%**	**8.4%**	**4.4%**
Mid	In	13.7%	16.9%	9.4%
	Out	10.0%	13.0%	6.3%
	Tot	**11.9%**	**15.0%**	**7.9%**

Figure 5:11: Bus Passenger Flow Changes (AM Peak Hour) – Core Test vs Test C1 and C2

5.7.6 The results show the greater modal shift that can be achieved both through extending the ART service to Westhill (Test C1) and through routeing along the A944 (Core test compared to Test C2).

5.7.7 The flow change figure shows:

- When the ART service is extended to Westhill (Test C1), passenger flow significantly increases between Westhill and the city centre, with a reduction in passengers on the A9119.
- When the ART service routes via the A9119 (Test C2) there is a corresponding increase in passenger flow on the A9119 and a reduction on the A944.

Road Traffic Flow Changes

Table 5:14: General road traffic 12-hour flow across the cordons (West Corridor Tests)

Cordon	Direction	% difference from Ref Case		
		Core - Kingswells P&R (via A944)	C1 - Westhill via A944	C2 - Kingswells P&R via A9119
Inner	In	-2.6%	-2.5%	-2.8%
	Out	-1.4%	-1.3%	-0.7%
	Tot	**-2.0%**	**-1.9%**	**-1.7%**
Mid	In	-4.0%	-4.2%	-3.4%
	Out	-6.6%	-6.7%	-6.5%
	Tot	**-5.3%**	**-5.4%**	**-4.9%**

5.7.8 The Road Traffic Demand daily traffic flow changes (AADT) between the Core Test and Test C1 and C2 are shown in the figure below (see Figure 5:2 for comparison of the Core Test to the Reference Case). The figure shows:

- The additional traffic re-routeing that occurs when ART is extended to Westhill (Test C1) with increases seen on the A93 and B9077 running parallel to, and immediately south of, the River Dee
- The range of traffic impacts in the city centre when ART routes via the A9119 (Test C2), as well as the traffic reductions on Fairley Road through Kingswells (as fewer passengers use the Kingswells P&R site – see below)

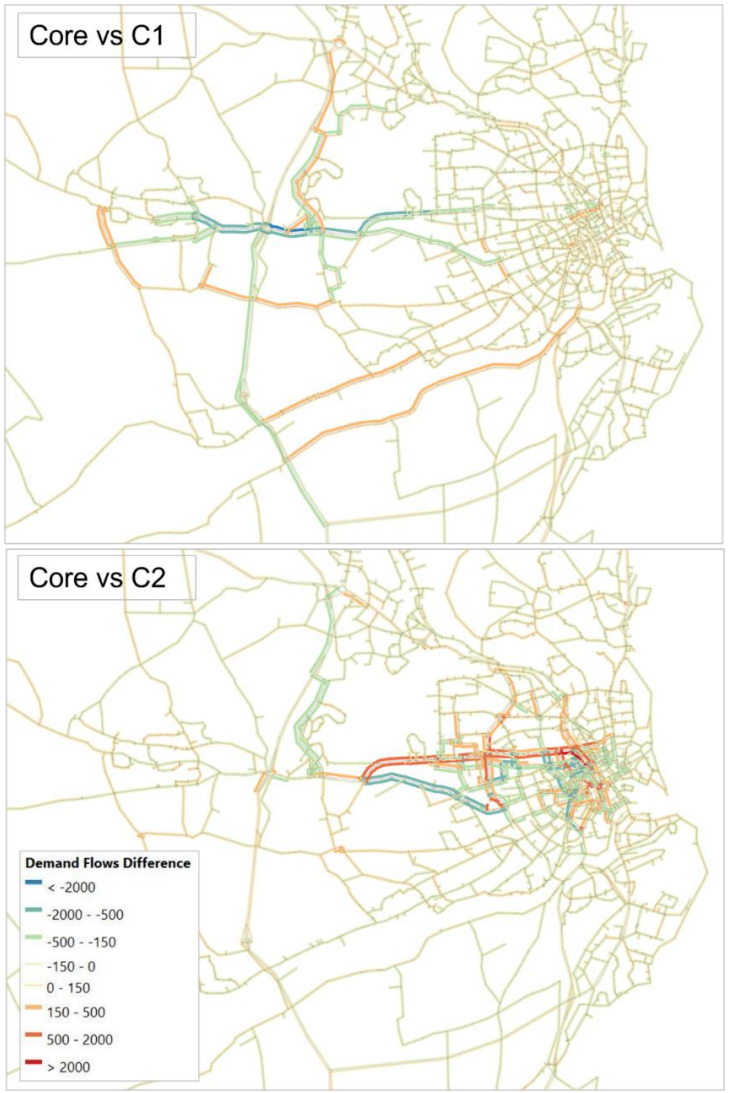


Figure 5:12: Road Traffic Demand Flow Changes (AADT) –Core Test vs Test C1 and Test C2

P&R / Mobility Hub Usage

5.7.9 Details of the impact on usage at Kingswells P&R, and a combined usage at Kingswells P&R and the modelled small-scale mobility hub at Westhill are presented below, indexed against use in the Reference Case.

Table 5:15: P&R Usage - average AM and inter-peak occupancy (West Corridor Tests)

Test	Kingswells P&R Usage (indexed to Reference Case = 100)	
	Kingswells P&R	Kingswells P&R and Westhill (new mobility hub)
Reference Case	100	100
Core – Kingswells P&R	221	221
C1 - Westhill	173	245
C2 – Kingswells P&R via A9119	179	175

5.7.10 The results suggest:

- With ART serving Kingswells P&R, as in the Core Test, usage of Kingswells P&R site more than doubles
- With ART extended to Westhill, as in Test C1, usage of Kingswells P&R site drops, but across both Kingswells P&R and Westhill Mobility Hub, usage of the two sites is above that of the Core test
- With ART routeing via the A9119 (Queen's Road as in Test C2), usage of Kingswells P&R site is less than that of the Core test i.e., there is greater use of the Kingswells P&R site when ART routes along the A944 into the city centre

West Corridor Summary

The results indicate the benefit in extending ART to Westhill and routing into the city via the A944, with increased modal shift, increased P&R usage and significant journey time benefits into the city. A route via the A944 is less constrained and has the space required to accommodate the proposals.

If ART were extended to Westhill, the role of, and configuration of, Kingswells P&R with respect to ART should be reviewed, however the site at Kingswells could provide an appropriate terminus point as part of a phased approach to delivery i.e. prior to a Westhill mobility hub becoming operational. At present, serving the site would add to journey times and with a Westhill service, the potential 'targeted' catchment for the site would be reduced. Note also that the current site at Kingswells could offer an opportunity for ART depot facilities (in the event of ART terminating at either Kingswells or Westhill). On-site surveys at Kingswells P&R are recommended to better understand the current role of this site.

5.8 South Corridor

5.8.1 The analysis for the south corridor as presented here considers the Core Test, and Test D as shown below.

Figure 5:13: South Corridor Tests (Core and D1)

Journey Times and Speeds

5.8.2 Changes in public transport travel time between origins and destinations to/from the south corridor are shown in Table 5:16. General road traffic travel times between the same origins and destinations as used for public transport above are presented in Table 5:17 alongside distance data to enable an appreciation of traffic re-routeing.

5.8.3 The results show similar results across the Core Test and Test D with:

- A reduction in travel time by bus of over 20% (around 9 minutes) inbound between Portlethen Mobility Hub and the city centre in the AM period, and over 12% (6 minutes) outbound in the PM period
- Minor reductions in travel time by bus between Portlethen Mobility Hub and Foresterhill Health Campus (1%-3%, equating to a maximum 4 minute reduction)
- A reduction in travel time by bus between Portlethen Mobility Hub and the airport of 4-9%, with the greatest reduction in AM period (for Test D) of around 7 minutes

Table 5:16: Travel time – Bus (South Corridor Tests)

Time Period	Origin	Destination	Travel Time (access walk, wait, transit, interchange wait, egress walk)				
			Time (mins)			% change from Reference Case	
			Reference Case	Core - Portlethen Mobility hub (via Wellington Road)	D - Portlethen Mobility hub (via West Tullos Rd)	Core - Portlethen Mobility hub (via Wellington Road)	D - Portlethen Mobility hub (via West Tullos Rd)
AM	Portlethen Mobility Hub	Union Street	46	37	37	-21%	-21%
	Portlethen Mobility Hub	Foresterhill Health Campus	71	70	70	-1%	-2%
	Portlethen Mobility Hub	Airport	87	83	80	-5%	-9%
PM	Union Street	Portlethen Mobility Hub	45	39	39	-13%	-12%
	Foresterhill Health Campus	Portlethen Mobility Hub	71	69	69	-2%	-3%
	Airport	Portlethen Mobility Hub	89	85	85	-5%	-4%

Table 5:17: Travel time and distance – General road traffic (South Corridor Tests)

Time Period	Origin	Destination	Travel Time					Distance				
			Time (mins)			% change from Reference Case		Distance (km)			% change from Reference Case	
			Reference Case	Core - Portlethen Mobility hub (via Wellington Road)	D - Portlethen Mobility hub (via West Tullos Rd)	Core - Portlethen Mobility hub (via Wellington Road)	D - Portlethen Mobility hub (via West Tullos Rd)	Reference Case	Core - Portlethen Mobility hub (via Wellington Road)	D - Portlethen Mobility hub (via West Tullos Rd)	Core - Portlethen Mobility hub (via Wellington Road)	D - Portlethen Mobility hub (via West Tullos Rd)
AM	Portlethen Mobility Hub	Union Street	18	18	18	0%	2%	10.2	10.2	10.2	0%	0%
	Portlethen Mobility Hub	Foresterhill Health Campus	21	21	21	1%	2%	13.9	13.9	13.9	0%	0%
	Portlethen Mobility Hub	Airport	24	24	24	0%	0%	27.2	27.2	27.2	0%	0%
PM	Union Street	Portlethen Mobility Hub	18	19	19	2%	1%	10.0	10.0	9.9	0%	-1%
	Foresterhill Health Campus	Portlethen Mobility Hub	24	25	25	6%	6%	13.6	13.9	13.8	2%	2%
	Airport	Portlethen Mobility Hub	24	24	24	2%	1%	27.4	27.4	27.4	0%	0%

Modal Shift

Bus passenger flows and general road traffic flows across the cordons are presented in Table 5:18 and Table 5:19 respectively to provide an indication of the flow changes under the Core Test and Test D. Alongside these are presented figures showing the change in flow per hour in the AM peak, comparing the Core Test with Test D (see Figure 5:1 for comparison of the Core Test to the Reference Case).

Passenger Flow Changes

Table 5:18: Bus Passenger 12-hour passenger flow across the cordons (South Corridor Tests)

Cordon	Direction	% difference from Ref Case	
		Core - Portlethen Mobility hub (via Wellington	D - Portlethen Mobility hub (via West Tullos Rd)
Inner	In	6.2%	6.9%
	Out	6.1%	7.4%
	Tot	**6.2%**	**7.1%**
Mid	In	13.7%	15.0%
	Out	10.0%	10.9%
	Tot	**11.9%**	**13.0%**

5.8.4 The results show the slightly increased modal shift to bus in Test D compared to the Core Test, suggesting a route via West Tullos Road / Great Southern Road/ Holburn Street is more beneficial than the full route in via Wellington Road. Traffic impacts across the cordons are broadly similar to other tests.

5.8.5 The diagram shows, as would be expected, an increase in passenger flow on the West Tullos Road (Test D) route into the city centre, and a corresponding decrease on Wellington Road from where the ART route varies under the tests (at the junction of Wellington Road and West Tullos Road).

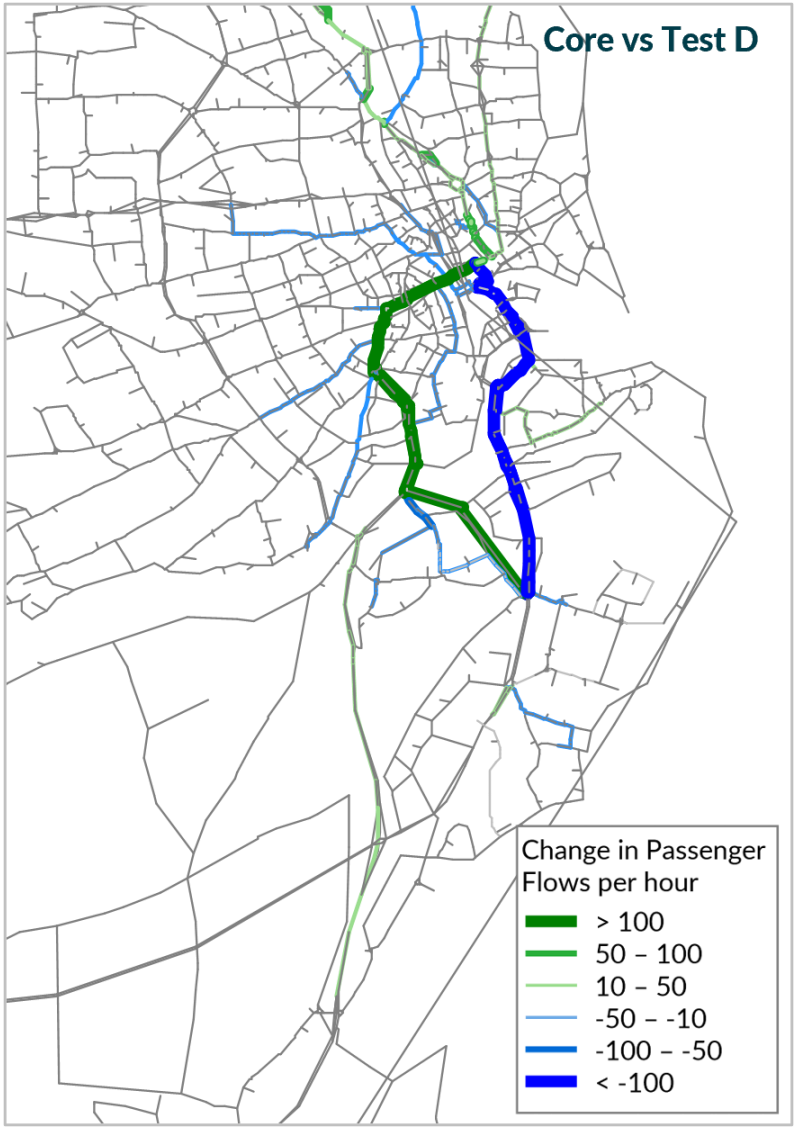


Figure 5:14: Passenger Flow Changes (AM Peak Hour) – Core Test vs Test D

Road Traffic Flow Changes

Table 5:19: General Road Traffic 12-hour passenger flow across the cordons (West Corridor Tests)

Cordon	Direction	% difference from Ref Case	
		Core - Portlethen Mobility hub (via Wellington Road)	D - Portlethen Mobility hub (via West Tullos Rd)
Inner	In	-2.6%	-3.0%
	Out	-1.4%	-1.0%
	Tot	**-2.0%**	**-2.0%**
Mid	In	-4.0%	-4.3%
	Out	-6.6%	-6.3%
	Tot	**-5.3%**	**-5.3%**

5.8.6 The figure shows the increase in traffic on Wellington Road under Test D – when ART routes via West Tullos Road. This increase is seen the length of Wellington Road from Charlestown junction – even though ART under Test D routes along a large section of this. There are decreases in traffic on the A92 between the Charlestown junction and the River Dee, and on Great Southern Road, but with increases on a parallel route via the Bridge of Dee and South Anderson Drive. There is also a notable decrease in traffic on Coast Road in Test D compared to the Core Test suggesting if ART routes into the city centre via the full length of Wellington Road / Victoria Bridge, there is some displacement of traffic onto the Coast Road.

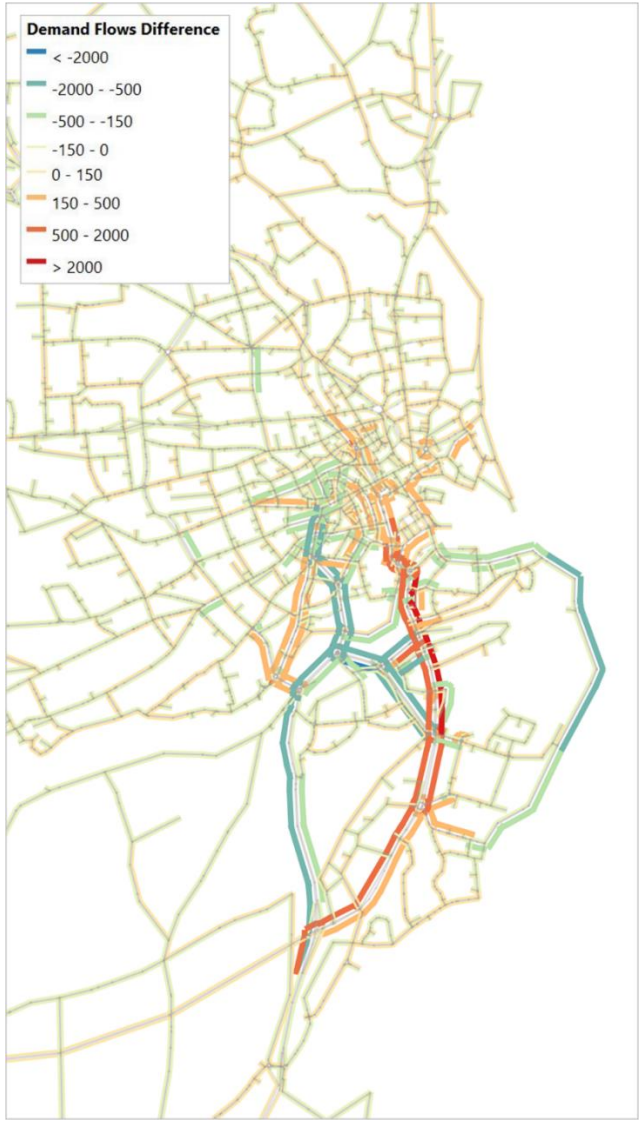


Figure 5:15: Road Traffic Demand Flow Changes (AADT) – Core Test vs Test D

P&R Usage

5.8.7 Details of the impact of the Core and Test D on the usage of Portlethen Mobility Hub are presented in the table below, indexed to usage in the Reference Case. Note the significant increase is due to the site being new, with limited services assumed to serve the site in the Reference Case.

Table 5:20: P&R Usage - average AM and inter-peak occupancy (West Corridor Tests)

Test	Portlethen Mobility Hub Usage (indexed to Reference Case = 100)
Reference Case	100
Core – via Wellington Road	423
D - via West Tullos Road	446

5.8.8 The results show:

- An increase in Portlethen Mobility Hub use when ART routes via Wellington Road / West Tullos Road / Holburn Street as in Test D.

South Corridor Summary

From Portlethen Mobility Hub, ART is recommended to route via Wellington Road, West Tullos Road, Great Southern Road and Holburn Street before running the length of Union Street. Modelling outputs indicate this generates a greater modal shift response than a route via Wellington Road / Victoria Street. Engagement highlighted a desire that ART serve Union Street and the West End and this option provides that.

In terms of implementation, it should be noted that Portlethen Mobility Hub is not yet built and the phasing of ART needs to take this into consideration given the site lies at a 'greenfield' location. As an alternative, the existing Park & Choose at Chapelton of Elsick could form the southern terminus, as least until the new Mobility Hub at Portlethen is operational.

5.9 Alternative Cross-City ART service Routeing

5.9.1 The analysis for the test where an alternative ART cross-city routeing combination was tested is presented here and considers the Core test and Test E, as shown below.

Figure 5:16: Alternative cross-city routeing test (Core and Test E)

5.9.2 Rather than focus on journey times, the analysis here has considered the modal shift implications of the changed routeing.

Modal Shift

5.9.3 For the modal shift analysis, as noted above for the other corridors, two cordons have been considered. Bus passenger flows and general road traffic flows across the cordons are presented in Table 5:21 and Table 5:22 respectively.

Table 5:21: Bus Passenger 12-hour passenger flow across the cordons (Alternative cross-city routeing test)

Cordon	Direction	% difference from Ref Case	
		Core	E – Alternative cross-city routeing
Inner	In	6.2%	5.3%
	Out	6.1%	5.1%
	Tot	**6.2%**	**5.2%**
Mid	In	13.7%	12.9%
	Out	10.0%	9.4%
	Tot	**11.9%**	**11.2%**

Table 5:22: General Road Traffic 12-hour passenger flow across the cordons (Alternative cross-city routeing test)

Cordon	Direction	% difference from Ref Case	
		Core	E – Alternative cross-city routeing
Inner	In	-2.6%	-2.5%
	Out	-1.4%	-1.2%
	Tot	**-2.0%**	**-1.8%**
Mid	In	-4.0%	-4.0%
	Out	-6.6%	-6.6%
	Tot	**-5.3%**	**-5.3%**

5.9.4 The results show a slight decrease in modal shift to bus under the alternative cross city routeing combination compared to the Core test.

P&R / Mobility Hub Usage

5.9.5 Usage at the four sites under both the Core and Test E are shown in the table below.

Table 5:23: P&R Usage - average AM and inter-peak occupancy (Alternative cross-city routeing test)

Test	P&R Usage (indexed to Reference Case = 100)			
	Bridge of Don	Craibstone	Kingswells	Portlethen Mobility Hub
Reference Case	100	100	100	100
Core	188	246	221	423

Test	P&R Usage (indexed to Reference Case = 100)			
	Bridge of Don	Craibstone	Kingswells	Portlethen Mobility Hub
Test E – Alternative cross-city routeing	191	244	219	425

5.9.6 The results suggest limited impacts on P&R usage with the alternative cross-city routeing pattern, when compared to the Core test.

Alternative Cross-city Routeing Summary

The results for Test E show a slight decrease in modal shift to bus under the alternative cross city routeing combination compared to the Core Test. The alternative routeing combination also does not provide for interchange between the two ART services and creates a potential 'dog-leg' in the service between Kingswells P&R and Craibstone P&R. Given this, this revised cross-city routeing pattern is not recommended for further consideration.

5.10 Three cross-city ART Service Routes

5.10.1 The analysis for the test where three ART cross-city routes was tested is presented here and considers the Core test and Test F, as shown below. When adding in the new route, the Core Test Kingswells-Bridge of Don cross-city route origins and destination are altered.

Figure 5:17: Alternative cross-city routeing test (Core and Test F)

5.10.2 Rather than focus on journey times, the analysis here has considered the modal shift implications of the additional ART service and the impacts on passenger and Road Traffic Demand changes.

Modal Shift

5.10.3 For the modal shift analysis, the two cordons have again been considered. Bus passenger flows and general road traffic flows across the cordons are presented in Table 5:24 and Table 5:25. Next to the cordon analysis are figures presenting a visual representation of the passenger and road traffic flow changes (presented below as change in passenger flow per hour in the AM peak), comparing the Core test with Test F (see Figure 5:1 for comparison of the Core Test to the Reference Case).

Bus Passenger Flow Changes

Table 5:24: Bus Passenger 12-hour passenger flow across the cordons (Three cross-city routes)

Cordon	Direction	% difference from Ref Case	
		Core	F – Three cross-city routes
Inner	In	6.2%	8.0%
	Out	6.1%	8.0%
	Tot	**6.2%**	**8.0%**
Mid	In	13.7%	12.5%
	Out	10.0%	11.7%
	Tot	**11.9%**	**12.1%**

5.10.4 The results show an increase in modal shift to bus under the three-arm cross city routeing combination compared to the Core test. This is to be expected given the additional ART service.

5.10.5 The flow change diagram shows:

- A significant increase in passenger flow between Robert Gordon University / Garthdee and the city centre
- A reduction in passengers on the A944 – the route has been impacted through its new connection to the Beach as opposed to King Street / the Bridge of Don under Test F
- A reduction in passengers on Kings Street – the route has been impacted through its new connection to the Portlethen Mobility hub as opposed to Kingswells under Test F.

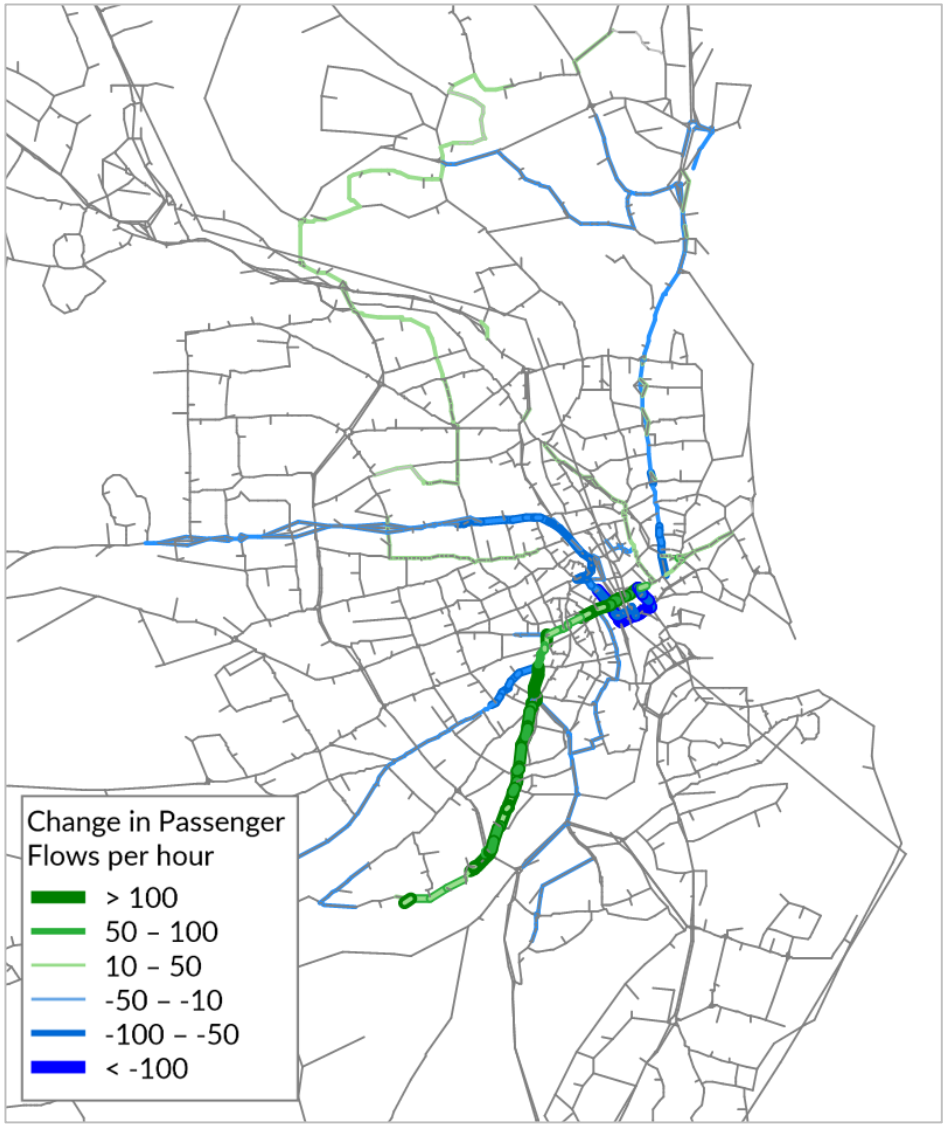


Figure 5:18: Passenger Flow Changes (AM Peak Hour) – Core Test vs Test F

Road Traffic Flow Changes

Table 5:25: General Road Traffic 12-hour passenger flow across the cordons(Three cross-city routes)

Cordon	Direction	% difference from Ref Case	
		Core	F – Three cross-city routes
Inner	In	-2.6%	-2.0%
	Out	-1.4%	0.4%
	Tot	**-2.0%**	**-0.8%***
Mid	In	-4.0%	-4.1%
	Out	-6.6%	-6.5%
	Tot	**-5.3%**	**-5.3%**

*awaiting clarification from SYSTRA

5.10.6 The figure shows the range of localised traffic re-routeing between RGU / Garthdee and the city centre due to the addition of RGU as a terminus for ART. There is limited impact on the area around the Beach despite the addition of the Beach as a terminus point for ART. It is however worth noting that under the Beach Masterplan proposals, the road network around the Beach area is being altered and is likely to be deterring general road traffic from that area in the Reference Case – hence the impact on ART on general road traffic around this location is likely to be limited.

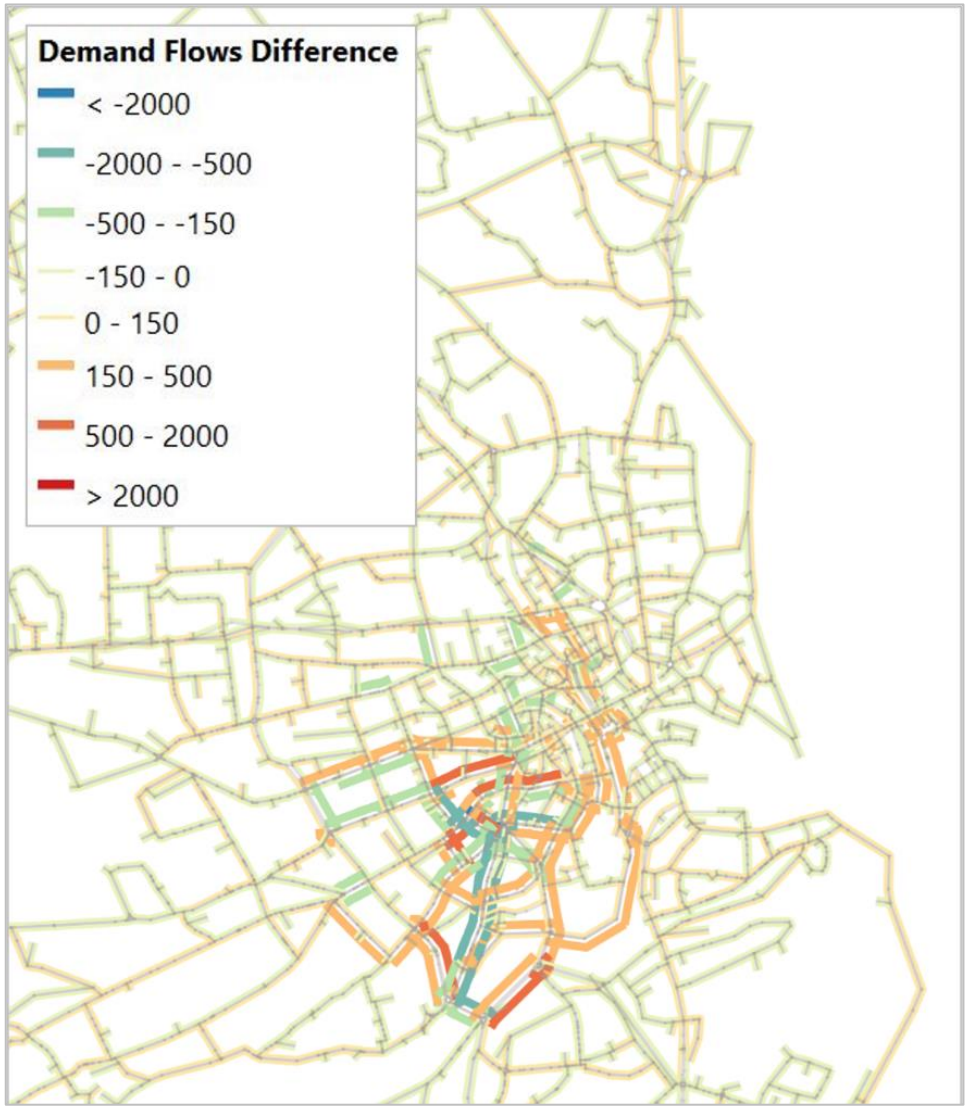


Figure 5:19: Road Traffic Demand Flow Changes (AADT) –Core Test vs Test F

P&R / Mobility Hub Usage

5.10.7 Details of the impact on P&R and Mobility Hub usage is presented below.

Table 5:26: P&R Usage - average AM and inter-peak occupancy (Three ART cross-city services test)

Test	P&R / Mobility Hub Usage (indexed to Reference Case)			
	Bridge of Don	Craibstone	Kingswells	Portlethen Mobility Hub
Reference Case	100	100	100	100
Core	188	246	221	423
Test F – Three cross-city ART routes	191	245	219	424

5.10.8 The results suggest limited impacts on P&R usage with the three cross-city routeing patterns when compared to the Core test. This is not unexpected as all sites are still served under Test F.

Three Cross-city ART Services Summary

The results suggest the removal of the cross-city connection between Bridge of Don P&R and Kingswells P&R has a negative impact on passenger volumes. As such, connecting the north and west corridors would provide the optimum solution here.

An ART route serving Robert Gordon University / Garthdee is worthwhile considering given the strong existing bus market. How such a connection could be incorporated into an overall ART network requires further consideration given its inclusion would create a '5th leg' to the ART network without a cross city destination. It could be included as part of ART at a later date, with an RGU to a fully developed Beach area an option.

5.11 Comparisons across all tests

Modal Shift

5.11.1 To provide a test overview across all test, the modal shift results from the two cordons are re-presented below with bus passenger flows and general road traffic flows across the cordons are presented in Table 5:27 and Table 5:28 respectively – and here with the results presented to an additional decimal place.

Table 5:27: Bus Passenger 12-hour passenger flow across the cordons (All Tests)

Cordon	Direction	% difference from Ref Case									
		Core	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	B1 – to Cloverhill	B2 – to Blackdog	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	D - Portlethen Mobility hub (via West Tullos Rd)	E – Alternative cross-city routeing	F – Three cross-city routes
Inner	In	6.2%	6.1%	5.9%	6.2%	7.7%	8.5%	4.4%	6.9%	5.3%	8.0%
	Out	6.1%	6.2%	6.1%	6.2%	7.7%	8.4%	4.4%	7.4%	5.1%	8.0%
	Tot	**6.2%**	**6.2%**	**6.0%**	**6.2%**	**7.7%**	**8.4%**	**4.4%**	**7.1%**	**5.2%**	**8.0%**
Mid	In	13.7%	13.6%	13.6%	13.0%	15.6%	16.9%	9.4%	15.0%	12.9%	12.5%
	Out	10.0%	10.1%	10.1%	9.5%	11.9%	13.0%	6.3%	10.9%	9.4%	11.7%
	Tot	**11.9%**	**11.9%**	**11.9%**	**11.3%**	**13.8%**	**15.0%**	**7.9%**	**13.0%**	**11.2%**	**12.1%**

Table 5:28: General Road Traffic 12-hour passenger flow across the cordons (All Tests)

Cordon	Direction	% difference from Ref Case									
		Core	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	B1 – to Cloverhill	B2 – to Blackdog	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	D - Portlethen Mobility hub (via West Tullos Rd)	E – Alternative cross-city routeing	F – Three cross-city routes
Inner	In	-2.6%	-2.8%	-3.0%	-2.4%	-2.8%	-2.5%	-2.8%	-3.0%	-2.5%	-2.0%
	Out	-1.4%	-1.6%	-1.8%	-1.2%	-1.5%	-1.3%	-0.7%	-1.0%	-1.2%	0.4%
	Tot	**-2.0%**	**-2.2%**	**-2.4%**	**-1.8%**	**-2.1%**	**-1.9%**	**-1.7%**	**-2.0%**	**-1.8%**	**-0.8%**
Mid	In	-4.0%	-4.1%	-4.1%	-4.0%	-4.1%	-4.2%	-3.4%	-4.3%	-4.0%	-4.1%
	Out	-6.6%	-6.6%	-7.1%	-6.7%	-6.7%	-6.7%	-6.5%	-6.3%	-6.6%	-6.5%
	Tot	**-5.3%**	**-5.4%**	**-5.6%**	**-5.3%**	**-5.4%**	**-5.4%**	**-4.9%**	**-5.3%**	**-5.3%**	**-5.3%**

Total Vehicle Kilometres

5.11.2 Figures were provided showing changes in total vehicle kilometres under each test and are presented below split out by change in Aberdeen city, Aberdeenshire and on the Aberdeen Western Peripheral Route (AWPR) itself. The figures provide an indication of traffic re-routeing under the tests but noting that modal shift to bus under each test will differ and be impacting on these figures i.e. greater modal shift to bus equates to reduced vehicle kilometers.

Table 5:29: Daily Vehicular Kilometres (All Tests)

Geography	Veh km	Reference Case	Core	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	B1 – to Cloverhill	B2 – to Blackdog	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	D - Portlethen Mobility hub (via West Tullos Rd)	E – Alternative cross-city routeing	F – Three cross-city routes
City	Veh km (000's)	2,773	2,819	2,811	2,814	2,825	2,818	2,817	2,813	2,822	2,827	2,819
	% change from Ref Case	N/A	1.6%	1.4%	1.5%	1.9%	1.6%	1.6%	1.4%	1.8%	1.9%	1.7%
Shire	Veh km (000's)	8,100	8,085	8,086	8,086	8,088	8,084	8,083	8,085	8,091	8,100	8,085
	% change from Ref Case	N/A	-0.2%	-0.2%	-0.2%	-0.1%	-0.2%	-0.2%	-0.2%	-0.1%	0.0%	-0.2%
AWPR	Veh km (000's)	806	820	820	817	820	821	819	817	818	819	821
	% change from Ref Case	N/A	1.8%	1.7%	1.3%	1.7%	1.8%	1.6%	1.3%	1.5%	1.5%	1.9%

5.11.3 The comparisons show all tests increasing vehicle kilometres overall but with an increase within Aberdeen City and a decrease in Aberdeenshire. It is worth reiterating as set out in the modelling caveats earlier in this chapter that no mitigation to prevent inappropriate re-routeing was modelled and as such these results should be viewed as providing an indication of what *could* happen if this important element of ART was not designed for.

5.11.4 Whilst the number of cars crossing the cordons reduces in all tests, overall car-km actually increases. The assumption here is the reduction in car-km caused by mode shift from car to bus (witnessed on the cordons) is outweighed by traffic re-routeing around Aberdeen as a result of the reduction in capacity on the ART corridors. **If ART is to contribute to a car-km reduction target, mitigation needs to be considered to reduce the scale of this re-routeing.** Further and more detailed analysis of these re-routing impacts and identification of appropriate mitigation will be required as the study progresses.

5.12 Network Viability

5.12.1 A very high level analysis was undertaken of overall annual changes to operational costs against estimated changed revenue. Operating costs included additional operating costs for ART services and reduced existing bus service operational costs due to changes made to accommodate ART services. Demand changes were used to estimate revenue impacts. Taken together, this provides a net operating cost / surplus, termed 'viability' here.

5.12.2 As noted in the modelling caveats earlier in this chapter, infrastructure assumptions, the indicative changes made to underlying bus services, and lack of modelling in relation to changed parking policy and mitigation to prevent inappropriate traffic re-routing, are all highly likely to be reducing the modelled benefits of ART in terms of modal shift, and the results as presented should be seen in this context (i.e., car journey times are likely to be longer and traffic speeds lower). Given this, rather than focus on absolute figures, the results presented here show the changed position in terms of 'viability' for all the test indexed to the Core Test (indexed to 100).

5.12.3 A viability 'score' of less than 100 indicates a more 'viable' network than the Core i.e. compared to the Core Test the net operating cost is lower. A score greater than 100 indicates that compared to the Core Test the net operating cost is higher.

5.12.4 The results indicate the benefit in a 'viability' sense of both routeing to Westhill and routeing via West Tullos from the south.

Table 5:30: Test Viability Summary

Option	Viability
	Indexed against Core = 100
Core	100
A1 - Craibstone P&R (direct inbound)	95
A2 - Craibstone P&R (alternating)	87
B1 – to Cloverhill	90
B2 – to Blackdog	101
C1 - Westhill via A944	93
C2 - Kingswells P&R via A9119	112
D - Portlethen Mobility hub (via West Tullos Rd)	86
E – Alternative cross-city routeing	82
F – Three cross-city routes	102

6 Appraisal Review

6.1 Introduction

6.1.1 Outputs from the ASAM modelling have provided additional analysis to feed into the wider appraisal, including both appraisal against the TPOs and the STAG criteria.

6.2 Transport Planning Objectives

6.2.1 The outputs of the modelling work have also been used to provide details of the journey time impacts of each of the tests and have enabled comparison of the options specifically against **Transport Planning Objective 1** set for the study, to ***achieve average ART bus speeds on the urban sections of the ART corridors (i.e., within the Aberdeen city boundary) of at least 25kph (16mph) by 2030.*** Note that no analysis is available during this exercise to provide any additional information to the TPO appraisal of TPO2 and TPO3 above that already provided in the Detailed Options Appraisal report.

6.2.2 The average bus speeds along the ART corridors across the tests is shown in the table below and shows the TPO being met for many of the test and ART services, and where not met, the speeds are often very close to meeting the TPO.

Table 6:1: Bus Speeds on ART services (end to end route)

Test	ART Service	Direction	Average Speed (kph)		
			AM	IP	PM
Core	Bridge of Don P&R <> Kingswells P&R	Eastbound	24.6	24.7	19.7
		Westbound	26.6	27.1	24.9
	Craibstone P&R (via Airport) <> Portlethen Mobility hub	Northbound	25.4	25.8	24.2
		Southbound	25.8	26.4	24.2
A1	Bridge of Don P&R <> Kingswells P&R	Eastbound	24.6	24.7	19.7
		Westbound	26.6	27.1	24.8
	Craibstone P&R (via Airport) <> Portlethen Mobility hub	Northbound	25.2	25.8	24.1
	Craibstone P&R (direct) <> Portlethen Mobility hub	Southbound	26.3	27.1	25.0
A2	Bridge of Don P&R <> Kingswells P&R	Eastbound	24.4	24.6	19.6
		Westbound	26.6	27.0	24.7
	Craibstone P&R (via airport and TECA) <> Portlethen Mobility hub (alternating service direction at airport / Craibstone)	Northbound	26.7	27.9	25.6
		Southbound	24.3	24.4	22.4
B1	Cloverhill <> Kingswells P&R	Eastbound	24.8	24.8	19.6
		Westbound	27.7	28.2	25.9
	Craibstone P&R (via Airport) <> Portlethen Mobility hub	Northbound	25.4	25.8	24.2
		Southbound	25.8	26.4	24.0
B2	Blackdog <> Kingswells P&R	Eastbound	27.0	27.1	22.0
		Westbound	30.6	31.1	28.9

Test	ART Service	Direction	Average Speed (kph)		
			AM	IP	PM
	Craibstone P&R (via Airport) <> Portlethen Mobility hub	Northbound	25.4	25.8	24.2
		Southbound	25.8	26.5	24.4
C1	Bridge of Don P&R <> Westhill	Eastbound	25.7	26.1	21.7
		Westbound	26.9	27.7	25.7
	Craibstone P&R (via Airport) <> Portlethen Mobility hub	Northbound	25.4	25.8	24.2
		Southbound	25.8	26.4	24.1
C2	Bridge of Don P&R <> Kingswells P&R (via Queen's Road (A9119)	Eastbound	24.0	24.3	19.4
		Westbound	26.0	26.2	25.2
	Craibstone P&R (via Airport) <> Portlethen Mobility hub	Northbound	25.4	25.8	24.0
		Southbound	25.8	26.5	24.3
D	Bridge of Don P&R <> Kingswells P&R	Eastbound	24.6	24.7	19.8
		Westbound	26.6	27.1	24.9
	Craibstone P&R (via Airport) <> Portlethen Mobility hub (via Holburn Street / West Tullos Road)	Northbound	27.0	27.4	25.8
		Southbound	26.9	27.4	25.3
E	Craibstone P&R (via Airport) <> Kingswells P&R	Northbound	25.5	25.7	24.0
		Southbound	26.3	26.9	24.4
	Bridge of Don P&R <> Portlethen Mobility hub	Northbound	24.5	24.8	19.9
		Southbound	25.9	26.4	25.1
F	Bridge of Don P&R <> Robert Gordon University	Northbound	21.2	21.2	16.2
		Southbound	23.6	23.8	23.1
	Kingswells P&R <> Beach	Eastbound	25.2	25.3	24.3
		Westbound	24.9	25.1	22.7
	Craibstone P&R (via Airport) <> Portlethen Mobility hub	Northbound	25.4	25.8	24.3
		Southbound	25.8	26.5	24.1

6.3 STAG Criteria

6.3.1 A very high level review of each Test against the STAG criteria, where deemed appropriate, has been undertaken and is presented below. It is difficult from the modelling outcomes presented here and overall purpose of the routeing work to differentiate between the options. In the table below the options have been compared relative to each other.

Table 6:2: STAG Criteria – High Level Appraisal

Criteria	Comment	Core	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	B1 – to Cloverhill	B2 – to Blackdog	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	D - Portlethen Mobility hub (via West Tullos Rd)	E – Alternative cross-city routeing	F – Three cross-city routes
Environment	Evaluated by considering modal shift	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓	✓✓	✓✓	✓✓
Climate Change	Evaluated by considering modal shift (noting that appropriate mitigation would be required to ensure this is the case) *	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓	✓✓	✓✓	✓✓
Health, Safety and Wellbeing	Generally similar outcomes across the tests but noting that Test C2 which routes to the west via the A9119 does not serve the hospital, and could be considered to have a reduced benefit compared to other tests.	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓
Economy	Evaluated predominantly by considering impact on bus passengers and general road traffic and re-routeing (but noting mitigation would be developed to minimise this). Note also: • on the west corridor, routeing via the A9119 (Test C2) does not serve the key employment sites at Foresthill Health Campus and the Aberdeenshire Council offices at Woodhill House, both located along Westburn Road (A944) • on the west corridor, extending ART to Westhill (Test C1) provides access to Arnhall Business Park	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓	✓✓	✓✓	✓✓
Equality and Accessibility	The communities of Torry, Kincorth, Tillydrone, Middlefield, Stockethill, areas of Mastrick and Seaton are all ranked amongst the 20% most deprived in Scotland. It is noted that: • routeing in the south corridor via West Tullos Road (as per Test D) while serving Kincorth, would not route as closely to Torry (served under the Core Test) • routeing via the A9119 (as per Test C2) would not serve the community of Mastrick (located to the north of Lang Stracht) • the communities of Tillydrone (located along A96) and Seaton (located along A956 north of Aberdeen) are served under all tests	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓✓	✓✓	✓✓

Criteria	Comment	Core	A1 - Craibstone P&R (direct inbound)	A2 - Craibstone P&R (alternating)	B1 – to Cloverhill	B2 – to Blackdog	C1 - Westhill via A944	C2 - Kingswells P&R via A9119	D - Portlethen Mobility hub (via West Tullos Rd)	E – Alternative cross-city routeing	F – Three cross-city routes
Public Acceptability	Evaluated through consideration of bus passenger benefits and impacts to general road traffic. Note that under Test E the ART routes do not interconnect in the city centre, which is likely to detract from the ART benefits and be viewed negatively by bus users. Test F includes a third ART service and an ART connection to Robert Gordon University is likely to be viewed favourably by students.	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓✓
Risk and Uncertainty	No clear difference across the tests, although Test F includes a link to the Beach, with the aim of connecting the city centre with the emerging Masterplan area. However, there is uncertainty as to the timeframe associated with the area. Note that Risk and Uncertainty across the entire ART programme is being governed through the appraisal process, and therefore has not specifically been considered in any detail within this Routeing Analysis.										

**to be discussed*

7 Conclusions and Summary

7.1 Overview

7.1.1 This report has presented various strands of work undertaken to provide information to inform decision making on the routeing for ART and includes the outcomes of the engagement and modelling work undertaken to support this.

7.1.2 Some 10 ART network and service tests were developed and modelled within ASAM19 considering different cross-city connections and terminus points along broad north, north-west, west and south corridors.

7.1.3 The outcomes of the modelling exercise combined with discussion and feedback through the various strands of engagement has enabled a recommendation on a preferred ART network to be reached.

7.2 Conclusions

7.2.1 The work has highlighted that:

- **For the North Corridor:**
  - With ART in place, there are positive impacts on bus journey times, modal shift and P&R usage. The benefits of extending ART further north to Blackdog are clear. The proposed mixed-use development at Blackdog and its location on the outskirts of the city at the junction of the AWPR and A90 provides an opportunity to develop a more appropriately located Mobility Hub to become the ART service terminus point to the north. Its location would also provide greater opportunity to capture demand from along the A947 i.e., Newmachar etc. A new Mobility Hub at Blackdog would also reduce vehicle kilometres into Aberdeen by capturing car trips from further out of the city than at the current Bridge of Don P&R site. Early discussions with those developing the Blackdog site is recommended.
  - The Bridge of Don P&R site is not well located for access, has not been successful, and as such, is currently not served. Reconfiguring the site for improved vehicular and bus access would be a significant undertaking. Although a smaller parking facility at Bridge of Don could be provided to cater for more localised demand (with access from such a site through to stops on the main carriageway), it could be presumed that the majority of demand at the site would shift onto local buses or to the Blackdog site for those coming from further afield – where the new Mobility Hub is assumed would be provided.
  - It is recognised that Ellon P&R site lies approximately 17km to the north of Blackdog and as such there is likely to be some abstraction from that site to Blackdog, with the potential for some increased vehicle kilometres due to users choosing to drive to the Blackdog site. However, consideration of how longer distance services from north of Aberdeen integrate with ART at Blackdog would help minimise this.
  - With Blackdog as a terminus, the Cloverhill development could be served via suitable access from the development to an ART stop on Ellon Road
- **For the North-West corridor**:
  - The results show the positive impact on bus journey times and speeds across the tests, with the various tests impacting on journey time from Craibstone P&R and the airport, dependent on whether there is a direct connection into / out of Aberdeen from those locations under each test. There are clear journey time benefits to those joining

the ART service at Craibstone P&R when the route into the city is not via the airport or TECA, but this is at the expense of journey times for those connecting with those sites.

- Further consideration is required and discussion advised with bus operators, and Aberdeen Airport and TECA, to determine the most appropriate routeing at the north-western end of the ART route, exploring the impacts on airport parking and revenue as well as access to TECA and the role of ART in supporting events at the centre. The role of Craibstone P&R should also be considered in this context.

- The optimum route into the city would be via the A96 / Great Northern Road, Powis Terrace, Powis Place, Mounthooly, and then Gallowgate and Broad Street. Note that uncertainty around the development and timing of the Berryden Corridor Improvement Project creates a risk for the design on the route and needs to be managed as the ART infrastructure proposals progress.

- **For the West corridor:**

  - The results indicate the benefit in routeing ART into the city via the A944, with increased modal shift, increased P&R usage and significant journey time benefits into the city

  - A route via the A944 is less constrained and has the space required to accommodate high levels of bus priority. Therefore ART services from Westhill into the city centre are recommended to route via the A944 (Lang Stracht and Westburn Road) and into the city via Skene Square and Union Terrace to Union Square. Modelling outputs indicate this provides a greater modal shift to public transport and faster journey times into the city centre than if the route was via the A9119 (Queen's Road).

  - A route via the A944 would enable ART to serve the Foresterhill Health Campus, a clear core destination for both employment and healthcare in the region

  - Running ART to Westhill is anticipated to increase modal shift to bus and could provide improved access to and from the town with a significant residential population and employment at Arnhall business park. A suitable Mobility Hub would be required as a terminus point in Westhill and further consideration of integration with services routing into Aberdeen from the hinterland is required.

  - If ART were extended to Westhill, the role of, and configuration of, Kingswells P&R with respect to ART should be reviewed. At present, serving the site would add to journey times and with a Westhill service, the potential 'targeted' catchment for the site would be reduced. On-site surveys are recommended to better understand the current role of this site. Note that the site at Kingswells could provide an appropriate terminus point as part of a phased approach to delivery i.e. prior to a Westhill mobility hub becoming operational, and the current site at Kingswells could offer an opportunity for ART depot facilities (in the event of ART terminating at either Kingswells or Westhill).

- **For the South corridor:**

  - From Portlethen Mobility Hub, the analysis has shown that the optimum routeing is via Wellington Road, West Tullos Road, Great Southern Road and Holburn Street, serving the west end of the city centre and running the length of Union Street. Modelling outputs indicate this generates a greater modal shift response than a route via Wellington Road / Victoria Street. Engagement highlighted a desire that ART serve (the length of) Union Street and this route provides that.

  - In terms of implementation, it should be noted that Portlethen Mobility Hub is not yet built and the phasing of ART needs to take this into consideration given the site lies at

a ‘greenfield’ location. As an alternative, the existing Park & Choose at Chapelton of Elsick could form the southern terminus, at least until the new Mobility Hub at Portlethen is operational.

- **In term of connecting with Robert Gordon University and the Beach area (through providing a 3rd ART cross-city route)**:

  - Engagement highlighted the desire for ART to serve Robert Gordon University, and the many existing bus services operating between the University of Aberdeen (on King Street) and RGU. A test was undertaken which included Robert Gordon University (and the beach) in the ART network (and altered the cross-city route connectivity accordingly). Under this test the modal shift achieved reduced compared to other tests and the results suggest the removal of the cross-city connection between Bridge of Don P&R and Kingswells P&R has a negative impact on passenger volumes. As such, connecting the north and west corridors is recommended.

  - However, given the strong preference for its inclusion, an ART route serving Robert Gordon University / Garthdee is worthwhile considering. How such a connection could be incorporated into an overall ART network requires further consideration.

  - Serving the Beach area did not feature as a strong priority through the engagement undertaken and the timescales for implementation and the build out associated with the Beach Masterplan adds a level of uncertainty. It could however be included as part of ART at a later date, with an RGU to a fully developed Beach area an option for ‘Line 3’.

7.3 Summary

7.3.1 Given the main points raised above, the analysis has shown that the optimum network is that **ART operates initially as two cross-city routes**:

- 'Red Line’: Blackdog to Westhill
- ‘Purple Line’: Craibstone P&R / airport to Portlethen Mobility Hub

7.3.2 The resultant ART network, given the above conclusions, is set out in the figure below.

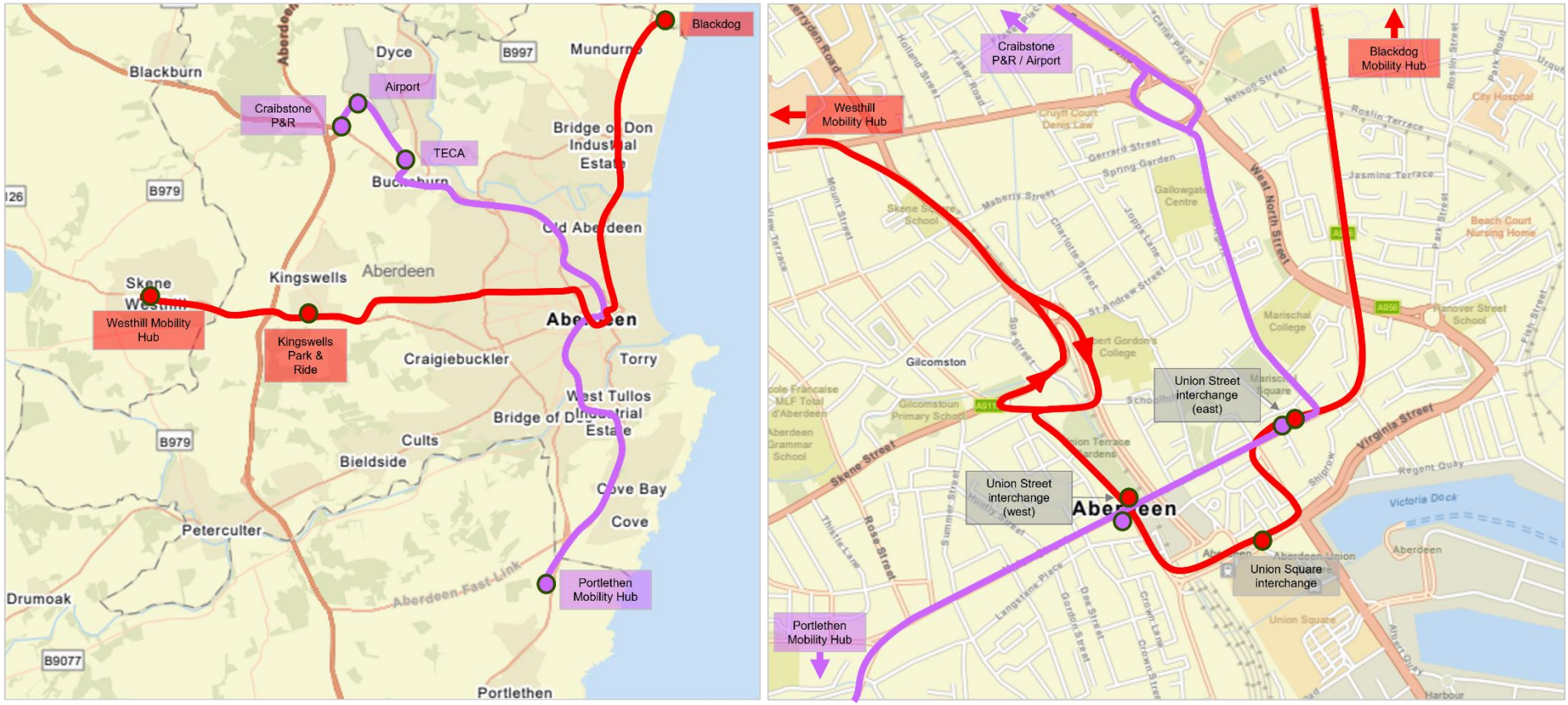


Figure 7:1: Recommended ART Network

TECHNICAL NOTE

Job No: 330610570

Date: 29th March 2024

Subject: **Supporting Technical Note A - ART Routeing Analysis – Bus Infrastructure**

Introduction

Overview

This Technical Note describes the bus priority infrastructure to support the modelling of the Aberdeen Rapid Transit (ART) route tests as set out in the ART Routeing Analysis Report (Stantec, March 2024). This note should be read in conjunction with that report, *Aberdeen Rapid Transit - Routeing Analysis – Report, Stantec, May 2024.*

Background

As part of the Detailed Options Appraisal (DOA) of ART, various options for the ART network were modelled in the Aberdeen Sub Area Model (ASAM19).

This testing used a single network for ART, enabling a comparison of how infrastructure and operating environments performed with all other things being equal. That was not to say, the chosen network was preferred, just that it was considered the most appropriate on which to understand the elements that were most likely to make ART a success. The network assumed for the modelling included the following four corridors:

- **North** A956 (N): Bridge of Don P&R to city centre
- **North - West** A96: Craibstone P&R to city centre via A96 (Auchmill Road, Great Northern Road, Powis Terrace, Powis Place, Causewayend) and Gallowgate
- **West** A944: Westhill to city centre via the A944 (Straik Road, Lang Stracht and Westburn Road) and then Skene Square / Denburn Road via the Berryden Corridor Improvement Scheme (BCIP)
- **South** A92 (S): Portlethen to city centre via A92, Great Southern Road (B9077) and Holborn Street (A9013)

The DOA concluded with a number of nest steps, including further consideration to establish a definitive routeing for the ART corridors and services – to be developed through discussion with those involved in the multi-modal corridor studies and through further engagement and modelling work.

As part of this routeing analysis work, ten ART route tests were developed and refined in consultation with the Council, bus operators and NESTRANS with the intention of being assessed in ASAM19 to gain greater certainty on how and where ART services should operate.

Most route tests are based on a Core network of two cross-city routes with subsequent tests making small but significant changes to one or both of the Core routes. Two of the tests are standalone assessments investigating an alternative cross city alignment or alternative destinations (to Robert Gordon University and the proposed Beach Development). Table 1 below describes the ten ART route tests, with a core test, and nine subsequent tests shown. The table also details the interchange location assumptions (where the ART routes would cross) given the routeing and cross-city connectivity assumed. The orange text in the table indicates what has changed in each test from the core test.

Note that based on the outcomes of the previous analysis undertaken on the ASAM matrices, a test where ART operates as four services interconnecting in the city centre is not considered further. The earlier analysis highlighted the poor performance of this in terms of estimated demand and revenue (due to the lack of new direct cross city connectivity).

As with the initial testing, assumptions have had to be made about the level of bus priority realistically achievable along each corridor. The remainder of this note describes the process of identifying these bus priority measures and from this, the information required to code these highway interventions into ASAM19, so ensuring each assessment attributed appropriate journey time benefits to the ART services in each test.

Table 1: ART routing tests

Test	ART Service Routes	Routeing	Purpose of Test
Core	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	N/A
A1	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Changed routeing at airport. Outbound: TECA → airport → Craibstone P&R Inbound: Craibstone P&R → city centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Changed routeing at airport Gauge comparative benefits of routeing inbound directly from Craibstone P&R site
A2	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Changed routeing at airport. Clockwise (every other service): city centre → TECA → airport → Craibstone P&R → city centre Anti-clockwise (every other service): city centre → Craibstone P&R → TECA → city centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Changed routeing at airport. Gauge comparative benefits of routeing both clockwise and anti-clockwise at Craibstone P&R / airport. Routeing would provide direct (and attractive) inbound routeing from P&R to city centre, as well as direct (and attractive) inbound routeing from Airport to city centre. Would enable trips from P&R to airport. Frequency of P&R to city centre *direct* service only every other ART service
B1	**North to West:** Cloverhill via Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing beyond Bridge of Don P&R to new housing development site (400 housing units assumed built out by 2030 and represented as such in ASAM 19 2030 Do Min model)
B2	**North to West:** Blackdog and Cloverhill via Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing beyond Bridge of Don P&R to the Blackdog development site (580 housing units built out by 2030 and represented as such in ASAM 19 2030 Do Min model)
C1	**North to West:** Bridge of Don P&R to Westhill	**North:** Ellon Road / King Street	Gauge benefits of extending western

Test	ART Service Routes	Routeing	Purpose of Test
	North-West to South: Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	corridor to Westhill rather than Kingswells P&R
C2	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A9119 (Queen's Road / Skene Road) / A944 **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing via A9119 instead of via A944 between city centre and A9119/A944 junction
D	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Holburn Street / Great Southern Road / West Tullos Road / Wellington Road	Gauge benefits of routeing south via Holburn Street / Great Southern Road / West Tullos Road / Wellington Road
E	**North-West to West:** Craibstone P&R (via airport and TECA) to Kingswells P&R **North to South:** Bridge of Don P&R to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	To gauge benefits of alternative combination of cross city services to compare to Core Test, i.e., NW-W and N-S Note: North to South provides direct routeing but North-West to West connection is far longer than straight line routeing (see mapping)
F	**North to South (RGU):** Bridge of Don P&R to Robert Gordon University **West to East (Beach):** Kingswell P&R to beach via Union Street **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **East:** Justice Street / Beach Boulevard **South (Portlethen Mobility Hub):** Market Street / Victoria Bridge / Wellington Road **South (RGU):** Holburn Street / Garthdee Road	To gauge benefits of alternative combination of cross city services to provide connectivity to RGU and Beach masterplan area as part of ART network

Methodology

Study Area

The assessment area covers the urban extents of Aberdeen City and outlying residential, employment and potential development areas. This includes, to the:

- **North:** Bridge of Don and proposed new residential settlements at Cloverhill and Blackdog
- **North-west**: Dyce, Kirkhill Industrial Estate and the Airport
- **West:** Kingswells, Prime Four, Westhill and Arnhall Business Park
- **South-west**: Robert Gordon University
- **South**: Kincorth, Altens, Cove Bay and Portlethen

The area over which infrastructure has been developed is defined by the extents of the ART route tests shown in Figure 1.

To identify the bus priority measures for each test, a review of the latest (as of February 2024) multi-modal corridor studies commissioned by Aberdeen City Council was undertaken. It was often the case that information from one or more corridor studies was needed. As such, the ART route tests were therefore split into eight bus priority corridors which allowed for a 'mix and match' process to identify the bus priority measures for each ART route test.

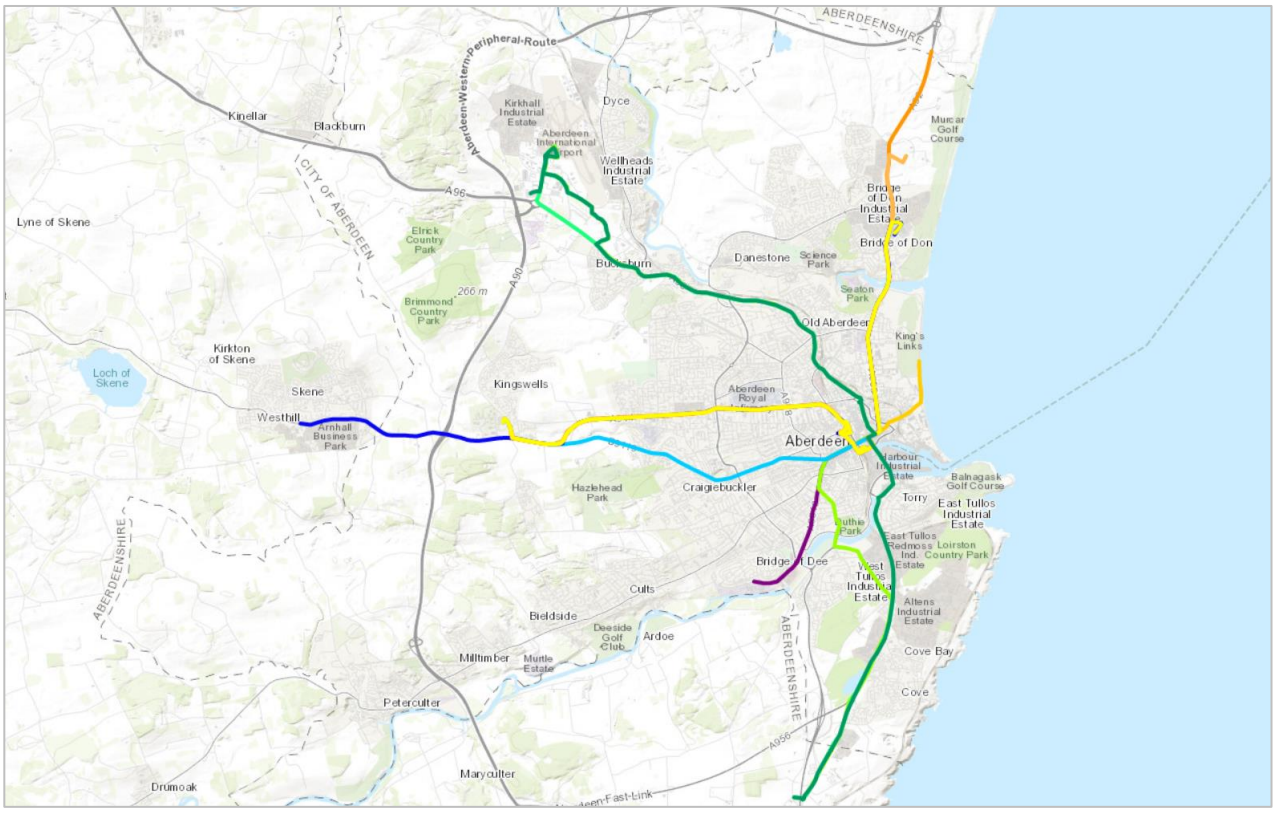


Figure 1: Extents of the ART route tests

Bus Priority Corridors

The eight bus priority corridors defined for the infrastructure are as follows:

- **A956/ A92 (North)**: City centre to the A92 junction with the A90 at Blackdog via *Union Street - King Street - Ellon Road*
- **Beach Boulevard**: City centre to Beach Masterplan area via *Union Street - King Street* - East North Street* - Castle Street* - Justice Street* - Beach Boulevard – Links Road (* These roads are used one-way by ART services depending on inbound or outbound services)*
- **A956 (South)**: City centre to the Findon Interchange junction via *Union Street - Market Street - Victoria Road - Menzies Street - Wellington Road – Old Stonehaven Road*
- **B9077 and West Tullos Road**: Holburn Street junction with Great Southern Road to the Hareness Road roundabout via *Great Southern Road (B9077) - West Tullos Road*
- **A9013**: City centre to the Robert Gordon University campus via *Union Street - Holburn Street - Garthdee Road*
- **A9119**: City centre to the A944 junction (Jessiefield roundabout) via *Union Street - Albyn Place - Queens Road - Skene Road*
- **A944**: City centre to Westhill via *Union Street - Market Street - Guild Street - Bridge Street - Union Terrace - Rosemount Viaduct* - Skene Street* – Woolmanhill* - Blackfriars Road* - Gilcomston Steps - Skene Square - Rosemount Terrace - Westburn Road - Lang Stracht - A944 – Straik Road (* These roads are used one-way by ART services depending on inbound or outbound services)*
- **A96**: City centre to the Craibstone Park & Ride via: *Union Street - Broad Street – Gallowgate – Causewayend - Powis Place - Powis Terrace - Great Northern Road - Auchmill Road - Inverurie Road - A96 - Airport Road* - Argyll Road* - Brent Road* - Argyll Road* -Dyce Drive* - Wellheads Drive* - Forrit Burns Road* - Gough Burn Crescent* (* These roads are used by some of the ART route tests but not others)*

Figures for each of these bus priority corridors are shown in the following sections along with a summary of the bus priority measures extracted from the relevant multi-modal studies. How these bus priority corridors relate to each ART route test is set out in Table 2.

ASAM19 Coding

To support the coding of bus priority measures into ASAM19 the following information was provided to the ASAM19 modelling consultants (SYSTRA):

- **Bus lanes**: Location, length and set-back length. It was assumed the bus lanes were operational for the full length of the modelled periods
- **Junction layouts**: The traffic lane designation at junction stop lines for the existing and proposed road layouts. This allowed ASAM19 to account (to some degree) for the capacity impacts of the proposals e.g. when a bus lane is extended up to the junction stop line or a vehicle turning movement banned. This traffic lane designation assessment at each main road junction along the bus priority corridors is provided in Appendix A
- **Signalised junctions**: A modified method of signal control would provide bus services with 'green wave' adaptive[1] priority on the approach to and through junctions using selective vehicle detection (SVD) and appropriate Urban Traffic Control (UTC) system
- **Traffic gating**: Queue relocation to assist bus service progression along sections of corridor where it was not possible to implement bus lanes
- **Bus stops**. Bus stop spacing was rationalised along the ART routes to reduce the bus stop time penalty resulting from vehicle deceleration and acceleration before and after the bus stop

[1] The priority level given to bus services at signalised junctions will depend on their adherence to timetable i.e. only a late bus will get a priority call and the extent of the priority call will depend on how late they are running.

Table 2: Bus priority corridors used by the ART route tests

ART Tests	Routes	A956/ A92 (North)	Beach Boulevard	A956 (South)	B9077 and West Tullos Road	A9013	A9119	A944	A96
Core	Route*: Craibstone - Portlethen			J1-J20b					J1-J28 (not J18-J19)
	Route*: Kingswells - Bridge of Don	J1-J13						J1-J27	
A1	Route*: Kingswells - Bridge of Don	J1-J13						J1-J27	
	Route: Craibstone - Portlethen			J1-J20b					J1-J28
A2	Route*: Kingswells - Bridge of Don	J1-J13						J1-J27	
	Route: Craibstone - Portlethen			J1-J20b					J1-J28
B1	Route*: Craibstone - Portlethen			J1-J20b					J1-J28 (not J18-J19)
	Route: Kingswells - Cloverhill	J1-J14						J1-J27	
B2	Route*: Craibstone - Portlethen			J1-J20b					J1-J28 (not J18-J19)
	Route: Kingswells - Blackdog	J1-J15						J1-J27	
C1	Route*: Craibstone - Portlethen			J1-J20b					J1-J28 (not J18-J19)
	Route: Westhill - Bridge of Don	J1-J13						J1-J32	
C2	Route*: Craibstone - Portlethen			J1-J20b					J1-J28 (not J18-J19)
	Route: Kingswells - Bridge of Don	J1-J13					J1-J12	J26-J27	
D	Route*: Kingswells - Bridge of Don	J1-J13						J1-J27	
	Route: Craibstone - Portlethen			J14-J20b	J1-J6	J1-J7			J1-J28 (not J18-J19)
E	Route: Craibstone - Kingswells							J1-J27	J1-J20
	Route: Portlethen - Bridge of Don	J1-J13		J1-J20b					
F	Route*: Craibstone - Portlethen			J1-J20b					J1-J28 (not J18-J19)
	Route: Kingswells - Beach		J1-J6					J1-J27	
	Route: RGU - Bridge of Don	J1-J13				J1-J16			

Corridor Infrastructure

Overview

The following provides a description of the bus priority measures along each of the eight corridors. As mentioned, the information was taken from the most recent STAG multi-modal corridor studies commissioned by Aberdeen City Council. Where a corridor or section of corridor was not included in these studies, an assessment was undertaken to develop high level bus priority proposals to ensure all corridors provided the ART network with a suitable operating environment but which reflected the constraints of the highway.

Types of Bus Priority Infrastructure

A key ART objective is to provide an alternative to the private car and reducing bus journey times to provide more equivalent journey times to the car is key to this. This requires traffic management interventions along the corridors to isolate services as far as possible from general traffic congestion. These measures mainly focused on the introduction of bus lanes either extended up to junction stop lines or more conventionally set-back from the junction. Other bus priority measures included traffic gating where the existing road layout makes it difficult to introduce bus lanes; bus advance areas to facilitate bus right turns; and an upgrade to bus stop layouts to reduce dwell times.

In addition to these physical measures, traffic signals along the corridors would include SVD to give buses adaptive priority on the approach to and through each junction via a suitable UTC system such a SCOOT, MOVA or Vehicle Attenuation (VA).

Bus lanes as part of the ART network would be expected to operate at anytime but local constraints such as to permit kerbside loading may require these bus lane operating times to be relaxed to daytime (7am – 7pm) or peak (7-10am and 4-7pm) periods.

It should be noted that in the multi-modal corridor studies, the bus priority proposals have been developed to an outline level of detail by assessing the spatial requirements of the schemes against the extents of the adopted highway. While the inclusion of these schemes in ASAM19 provides a strategic assessment of how these schemes impact the wider network e.g. drivers using alternative routes to avoid localised congestion, there has been little, or no local junction capacity assessment. This would help to understand the impact these schemes have on the operation of individual junctions and enable the development of mitigation to avoid lost green time or more importantly secondary impacts related to exit-blocking of upstream junctions. This more detailed assessment will be undertaken as the multi-modal corridor studies progress.

A956/ A92 (North)

Description

The corridor (Figure 2) extends north of the city centre from Union Street along King Street and Ellon Road to the A92 junction with the A90 at Blackdog. King Street is a wide 3 lane single road carriageway with some on-street parking, waiting and loading provision. There are frequent side road junctions with major junctions that are either signalised or multi-lane roundabouts. There are several existing bus lanes on King Street predominantly in the outbound direction operating 7.30 – 9.30am and 4 - 6pm (Monday to Saturday).

Inbound

- Harrow Road to St. Machar Drive
- Summerfield Terrace to West North Street

Outbound

- Pittodrie Street to Orchard Street
- Linksfield Road to Regent Walk
- Regent Walk to St Machar Drive
- Seaton Place to Don Street
- Don Street to Esplanade (with a short break in the bus lane over the Lidl car park access)

All these bus lanes are set-back from the approach junction.

At the Bridge of Don, Ellon Road becomes a dual carriageway which extends to the AWPR junction at Blackdog. There is an inbound bus lane between the Parkway East roundabout to approx. 100 metres south of the North Donside Road roundabout.

The following bus priority proposals are set out in the multi-modal corridor study ***Ellon Park & Ride to Garthdee Detailed Appraisal*** report prepared by Aecom (May 2023). The proposed road layouts for the corridor can be found in Appendix C of the Aecom report.

King Street

Inbound and outbound bus lanes are proposed between West North Street and the St. Machar Drive roundabout which is removed and replaced with a signalised cross-roads. All bus lanes are set-back from the approach junction to maintain existing traffic lane designations at the junction stop lines.

North of the St. Machar Drive junction the existing bus lane on the approach to this junction is extended to the Esplanade junction. In the outbound direction the existing bus lane is extended back towards the St. Machar Drive junction but cut short at Seaton Place to accommodate a two-way cycle track which extends northwards over the Bridge of Don.

Ellon Road

On the Bridge of Don an inbound bus lane is proposed that ties into the existing northbound bus gate. It is unclear why this bus lane has been proposed as the nearside lane currently operates as a virtual bus lane.

On the north side of the bridge an inbound bus lane extends from about 250 metre south of the Berryhill Crescent roundabout (near to the proposed Cloverhill development) to join with the new bus lane on the Bridge of Don. In the outbound direction a new bus lane starts just after Balgownie Crescent and extends northwards to just after the Esso Petrol Filling Station.

Both the inbound and outbound bus lanes pass through the North Donside Road and Parkway roundabouts which in the proposals are removed and replaced with signalised cross-roads.

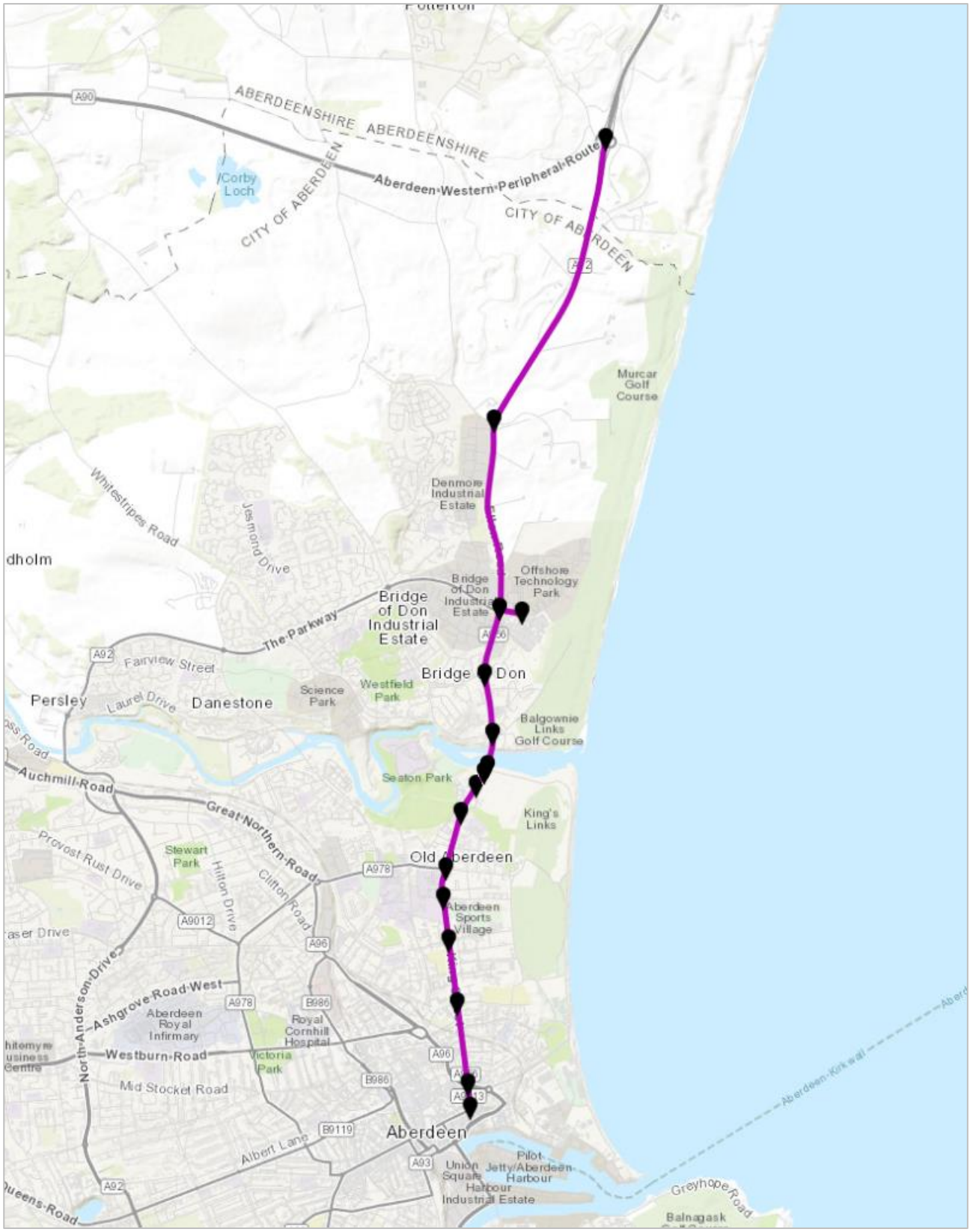


Figure 2: A956 (North) corridor

Beach Boulevard

Description

This short corridor (Figure 3) extends north-east of the city centre along Beach Boulevard towards the proposed Beachfront development area. It is proposed that inbound and outbound ART services take different routes before joining Beach Boulevard. Outbound ART services use King Street and turn right onto East North Street while inbound services use Justice Street and a new 'bus only' link to access Castle Street and Union Street. Links Road is used as an alternative route to the Esplanade because the City Centre & Beachfront Masterplan proposals close Beach Boulevard to traffic east of the Links Road junction.

Beach Boulevard and the section of King Street south of East North Street is not part of a multi-modal corridor study but both are within the above Masterplan. The following bus priority measures have therefore been developed taking cognisance of the aspirations set out in the Masterplan for the city centre.

King Street (outbound)

King Street between Castle Street and East North Street forms part of the City Centre and Beachfront Masterplan and as such no bus lanes are proposed within this section of the corridor. It is assumed that bus services travelling through the King Street junction with East North Street would get priority signal timings to reduce journey times.

East North Street (outbound)

No bus lanes are proposed on this short section of East North Street but it is assumed that the method of traffic signal control at the East North Street junction with Beach Boulevard would give buses adaptive priority in both directions i.e. East North Street to Beach Boulevard outbound and Beach Boulevard to Justice Street inbound.

Justice Street (inbound)

The City Centre and Beachfront Masterplan proposes a new 'bus only' link between Justice Street and Castle Street/ Union Street which it is proposed will be used by ART services.

Beach Boulevard and Links Road

No bus priority measures are proposed.

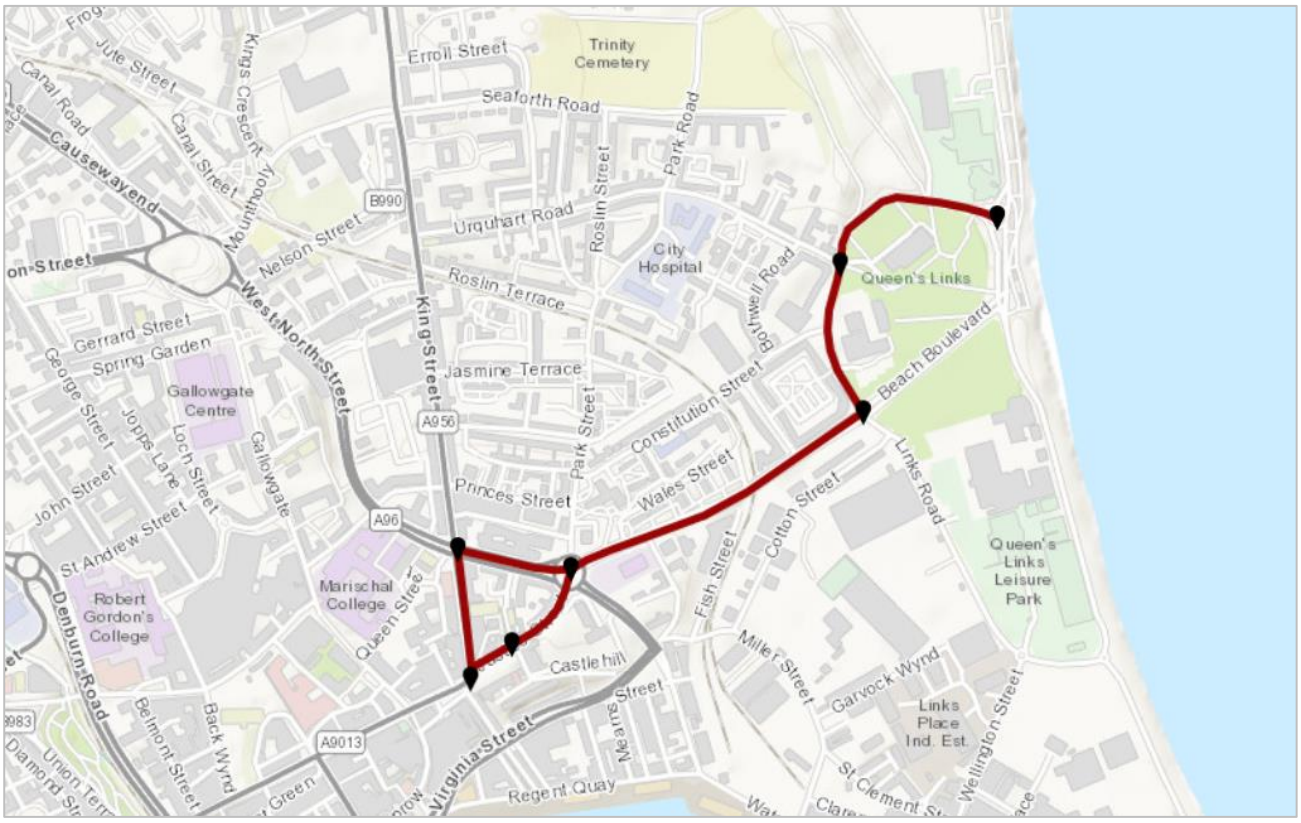


Figure 3: Beach Boulevard corridor

A956 (South)

Description

The corridor (Figure 4) extends south of the city centre from Union Street along Market Street, Victoria Road via Victoria Bridge, Menzies Road, Wellington Road and Old Stonehaven Road.

Market Street between its junctions with Guild Street and the Victoria Bridge is a dual carriageway road with frequently spaced large signalised junctions.

Victoria Bridge contains a single carriageway road which widens along Victoria Road to four lanes south of the bridge. There are two closely spaced signalised junctions at South Esplande West/ East and Menzies Road. Menzies Road is a single carriageway road with a one-way outbound general traffic lane and contra-flow inbound bus lane in the other lane. There is residential parking along the southern side of the road.

Wellington Road is a dual carriageway road with the exception of a short section just south of the South Esplanade West roundabout between Grampian Place and Polwarth Road. Within this section, the road narrows to three lanes with an inbound bus lane extending from the roundabout to Kerloch Place. There are no other bus lanes along Wellington Road despite the road being used by up to 12 buses per hour.

Key junctions include those at Balnagask Road (signalised cross-roads); Abbotswell Road (signalised T); Greenwell Rd/ Craigshaw Rd (priority T); Greenbank Road (signalised cross-roads); Craigshaw Drive/ Altens Farm Road (signalised cross-roads); Hareness roundabout (priority); Souterhead roundabout (signalised); and Wellington Circle/ Charleston Road North (signalised cross-roads).

At the trunk road section of the A956, Wellington Road becomes a single carriageway road which continues along Old Stonehaven Road up to the Findon Interchange and where ART services are proposed to terminate. Key junctions include those at Gateway Drive, Old Stonehaven Road and Findon Interchange.

The following bus priority proposals are set out in the ***Wellington Road STAG Part 2 Appraisal*** report prepared by Aecom (Summer 2021). This study used the combined active travel and bus priority scheme, with the proposed road layouts provided in Appendix A of the Aecom report. This information was supplemented by a more recent Aberdeen City Council commission which updated proposals for the Souterhead and Hareness roundabouts and can be found in the ***DMRB Stage 2 report*** (Option K) provided by Sweco (January 2024).

Market Street, Victoria Road & Menzies Street

This section of the southern ART route is not included in the above Wellington Road study or any of the other multi-modal corridor studies. Assumptions where therefore made about the appropriate levels of bus priority that could be accommodated along these roads.

Given the importance of Market Street to the Harbour area and the frequency of large, signalised junctions along it, bus lanes were unlikely to be feasible so the existing road layout was retained in the ART route tests. This was also true for Victoria Bridge and Victoria Road although some traffic signal priority was provided to help bus services make the right turn outbound and left turn inbound at the junction with Menzies Road. Menzies Road includes an existing inbound contra-flow bus lane and given the limited road space outbound ART services would continue to share the single traffic lane with general traffic. There is however an option to provide a contra-flow bus lane on South Esplande West which could be used by ART services instead of the mixed traffic route on Menzies Road. This bus lane would however reduce on-street parking provision and require HGV loading activity generated by the adjacent Industrial Estate to be managed.

Wellington Road

Bus lanes are provided on both sides of the road between the South Esplande West roundabout (adjacent to the River Dee bridge) and the Souterhead roundabout. These bus lanes are set-back from junctions with short breaks to accommodate side road traffic. Longer set-backs are proposed on the approach to the Hareness roundabout to maximise junction capacity and road widening is required between Grampian Place and Polwarth Road to overcome the narrow section of corridor described above.

The Sweco study proposes the northbound bus lane approaching the Hareness roundabout can be used by HGV's to improve the efficiency of freight movements to and from the harbour and adjacent Industrial Estates.

Old Stonehaven Road

No bus priority measures are proposed.

Figure 4: A956 (South) corridor

B9077 and West Tullos Road

Description

The corridor (Figure 5) extends south of the city centre along the Great Southern Road and West Tullos Road via the King George VI bridge. This short corridor creates a link between the two city centre corridors along the A956 (Wellington Street) and the A9013 (Holburn Street).

Great Southern Road is a dual carriageway road. There is a short section where the dual carriageway layout ends to accommodate a right turn into Murray Terrace. Key junctions are located at Holburn Street, Whinhill Road and Riverside Drive all of which are priority roundabouts.

West Tullos Road has a similar dual carriageway layout. Key junctions are located at Great Southern Road, Abbotswell Road and Harness Road again all priority roundabouts.

Neither Great Southern Road nor West Tullos Road are part of the multimodal corridor studies, so the following bus priority proposals have been developed by this study. This involved a high level assessment of available road space, the complexity of junctions and existing traffic congestion levels to ensure ART services could operate as far as possible in free flow conditions on the approach to and through junctions.

Great Southern Road (B9077)

It is proposed that between the Holburn Street and Whinhill Road roundabout junctions, bus lanes are provided on both sides of the road. The narrower section of road at the Murray Terrace junction suggests staggered bus lanes between the Whinhill Road and Riverside Drive roundabouts offer a more efficient reallocation of road space. An inbound bus lane is therefore proposed between Allenvale Road and Whinhill Road roundabout and an outbound bus lane proposed between the Allenvale Road and Riverside Drive roundabout. In both cases it is suggested the bus lanes are set-back from the junction but a signalisation of the Whinhill Road junction may allow the inbound bus lane to extend through the junction and so provide a continuous bus lane between Holburn Street and Allenvale Road.

Set-back bus lanes are proposed on King George VI bridge section of Great Southern Road but further design work is required to establish the potential capacity impact this will have on the operation of the roundabout junctions on each side of the river (i.e. Riverside Drive and West Tullos/ Provost Watt Drive).

West Tullos Road

Inbound and outbound bus lanes are proposed, reducing general traffic to a single lane in each direction. It is proposed the bus lanes are set-back from the roundabout junctions along West Tullos Road including those at Provost Watt Drive, Abbotswell Road and Harness Road.

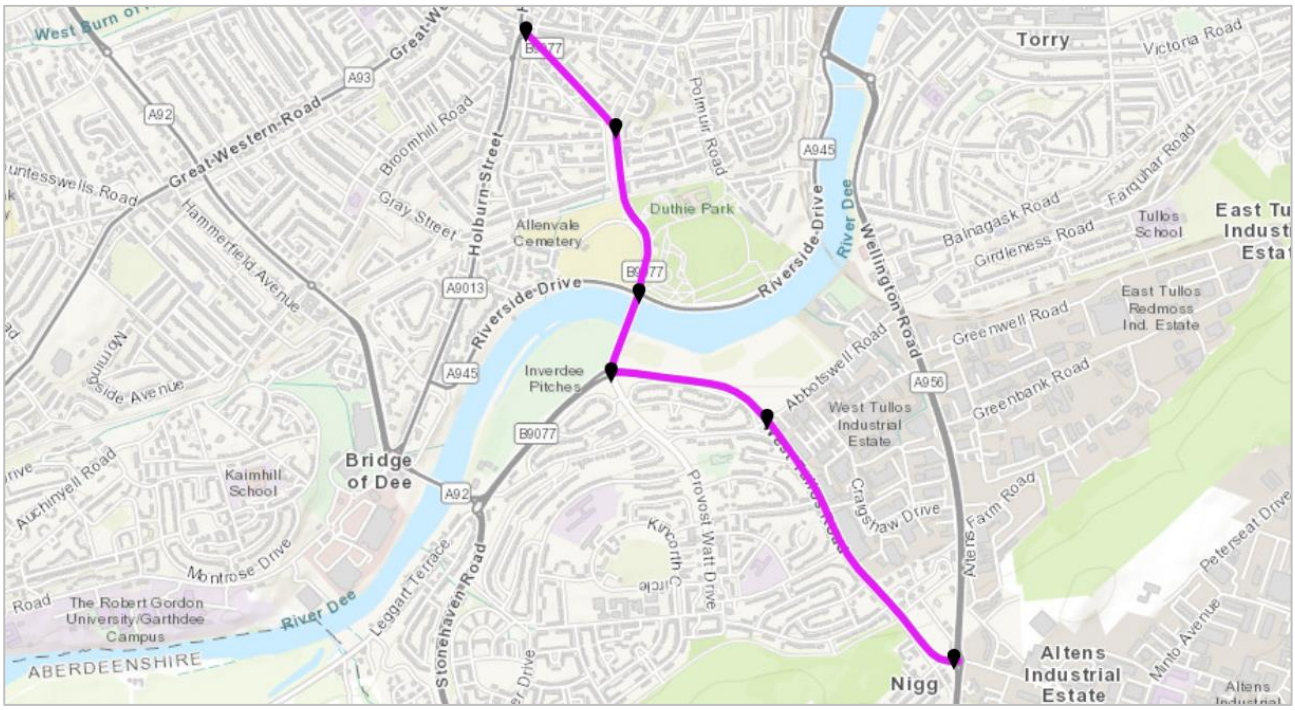


Figure 5: B9077 and West Tullos Road corridor

A9013

Description

The corridor (Figure 6) extends south-west of the city centre from Union Street along Holburn Street and Garthdee Road to the Robert Gordon University campus.

Holburn Street has a narrow four lane single road carriageway with sections of on-street parking, waiting and loading provision. There are frequent side road junctions with major junctions being either signalised junctions or multi-lane roundabouts. There is an existing inbound bus lane between the Great Southern Road and Union Grove junctions which operates 7.30 – 9.30am and 4 - 6pm (Monday to Saturday).

The following bus priority proposals are set out in the ***Ellon Park & Ride to Garthdee Detailed Appraisal*** report prepared by Aecom (May 2023). The proposed road layouts for the corridor can be found in Appendix C of the Aecom report.

Holburn Street

The existing inbound bus lane between the Great Southern Road and Union Grove junction is retained with a short extension from Union Grove towards the Alford Place junction.

Garthdee Road

Due to the width of the road, highway boundary constraints and the requirement for a protected cycle route no bus priority measures are proposed for Garthdee Road.

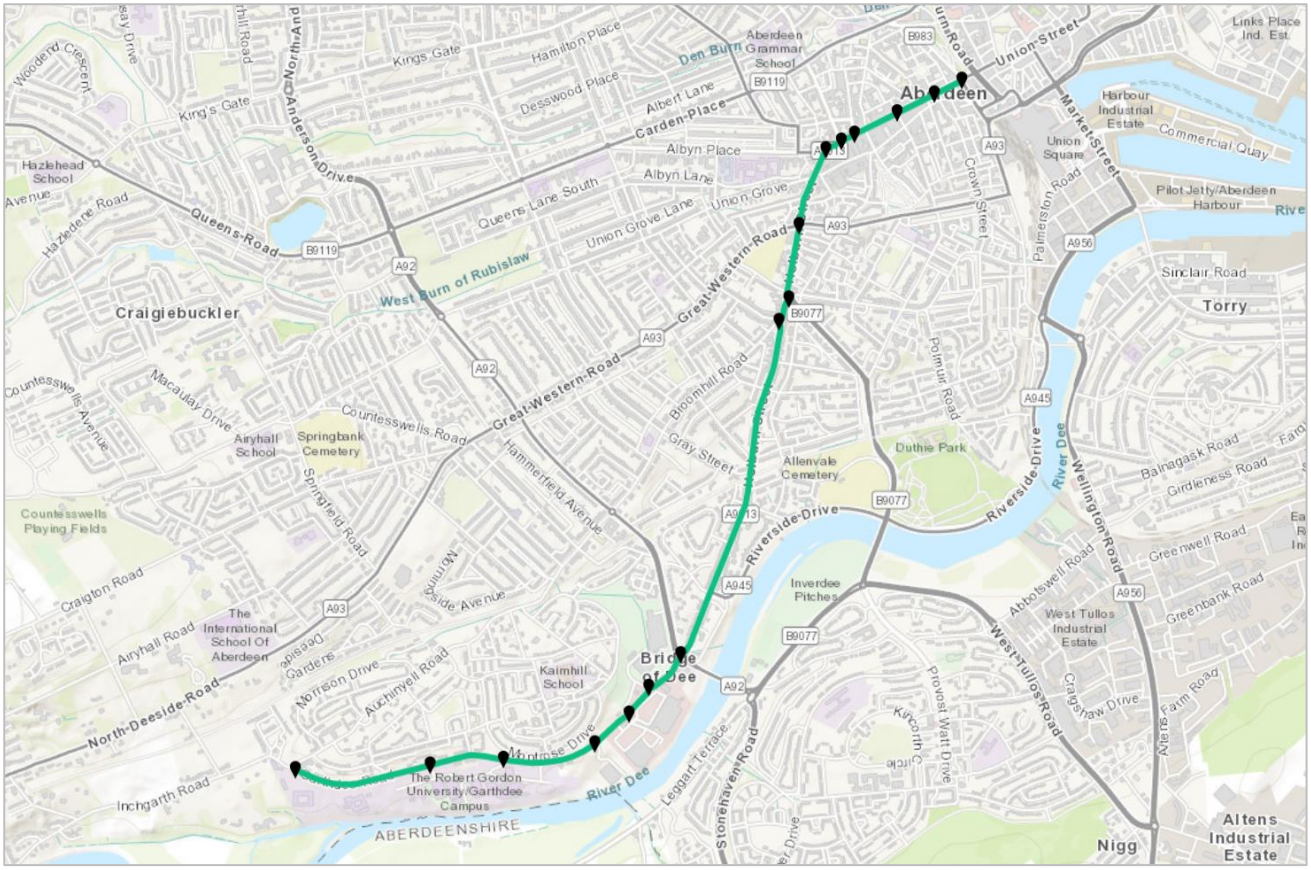


Figure 6: A9013 corridor

A9119

Description

The corridor (Figure 7) extends west of the city centre from Union Street along Alford Place, Albyn Place, Queen's Road and Skene Road.

Alford Place and Albyn Place is a wide single carriageway road with residential, Pay & Display and car club parking bays on the northern side of the road. Local schools are likely to create congestion at the start and end of the school day.

Queen's Road is a three to four lane single road carriageway with residential frontages and frequent side road junctions. On-street parking, waiting and loading is permitted along most sections with waiting restricted to the off peak periods. In addition to crossing the inner city bypass (Anderson Drive) the road provides key access points to extensive residential areas, employment sites (Hill of Rubislaw) and schools (Hazlehead Primary and Hazlehead Academy). Key junctions are located at the Queen's Cross roundabout, Forest Road (roundabout), Anderson Drive (roundabout), Queens Parade (signalised T), Hill of Rubislaw (signalised T), Springfield Road (signalised T) and King's Gate (roundabout). There are inbound bus lanes on the approach to the King's Gate and Anderson Drive junctions which operate 7.30 – 9.30am and 4 - 6pm (Monday to Saturday).

Skene Road is a single carriageway road with predominantly green verges and open land beyond. It has few side roads and little demand of on-street parking, waiting and loading. There is an inbound bus lane set-back from the Groats Road junction which operates at the times above.

The following bus priority proposals were developed as part of the ***A944 / A9119 multi-modal corridor study – Detailed Options Appraisal*** undertaken by Stantec, reported in July 2022. The proposed road layouts are provided in the Concept Design Report (Appendix A6) that accompanied the main report.

The adopted highway along the corridor is constrained predominantly by property boundaries which makes road widening to accommodate new bus priority and cycle route infrastructure difficult to achieve. The above Stantec report therefore set out options where road space was either reallocated to provide bus lanes or a segregated cycle route. To define the infrastructure needed for ART along this corridor, the option where bus priority measures are 'prioritised' has been used but requires the cycle route to be provided on parallel roads.

Albyn Place

Bus lanes are proposed outbound on the approach to the Queen's Cross roundabout and inbound on the approach to the Holburn Street junction. Due to highway boundary constraints the bus lanes are staggered and set-back from junctions.

Queen's Road

From the Queen's Cross roundabout, staggered bus lanes are provided in both directions between Queen's Cross and Forest Road and Forest Road and Anderson Drive. Highway boundary constraints require these bus lanes to be set-back from the junctions. As part of these proposals the roundabout at the Forest Road junction is removed and replaced with a signalised cross-roads.

For the section of Queen's road between the Anderson Drive and Kings Gate roundabouts, staggered bus lanes set-back from junctions are provided on the approach to all key junctions including those are the Hill of Rubislaw, Summerfield Road and King's Gate. The inbound bus lanes approaching the Anderson Drive and Kings Gate roundabout are extensions of existing bus lanes.

Skene Road

The existing inbound bus lanes on the approach to the Groats Road junction is retained.

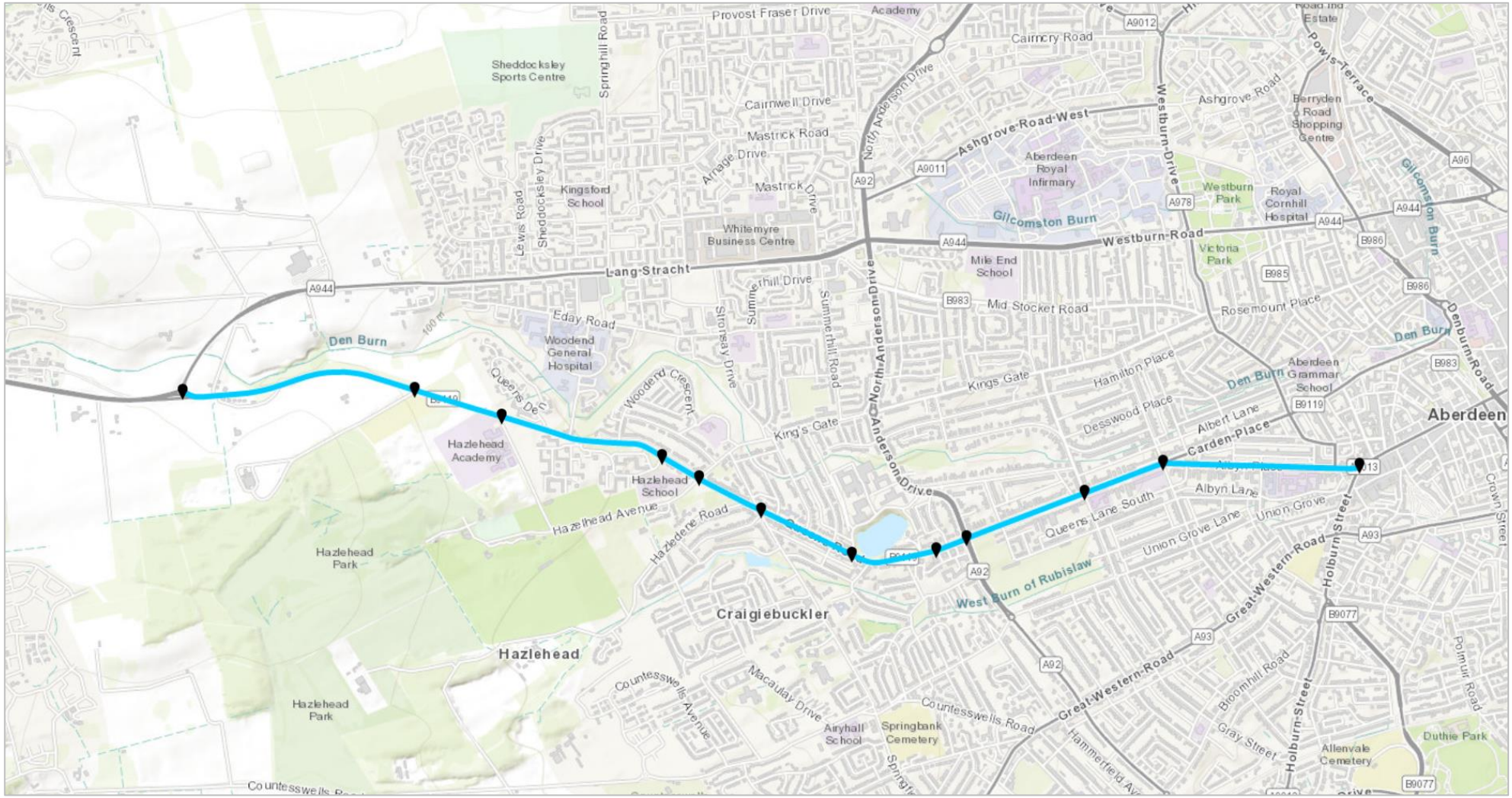


Figure 7: A9119 corridor

A944

Description

The corridor (Figure 9) extends west of the city centre from Union Street along Skene Square, Rosemount Terrace, Westburn Road, Lang Stracht, A944 and Straik Road to Westhill. ART services between Skene Square and Union Terrace are proposed to operate in a one-way loop shown in Figure 8.

Figure 8: Proposed routing of ART services between Skene Square and Union Street

As part of the Berryden Corridor Improvement Project (BCIP), Skene Square becomes a dual carriageway and the junction with Rosemount Terrace is signalised. The BCIP scheme also widens the Caroline Place junction with Westburn Road, Berryden Road and Hutcheon Street.

Westburn Road between its junctions with Caroline Place/ Berryden Road and Cairnfield Place is a wide single carriageway road with frequent side roads. Key junctions at Watson Street/ Cornhill Road and Argyll Place/ Argyll Crescent are signalised and where localised widening provides an additional lane at the stop lines. The inbound right turn from Westburn Road to Argyll Place is banned to facilitate the outbound right turn into Argyll Crescent. The kerbsides are covered with a no waiting at any time restriction with residential parking bays provided at some locations.

Westburn Road to the west of the Cairnfield Place becomes a dual carriageway road which extends to the North Anderson Drive junction. The only significant junction is at Foresterhill Road which provides access to the Aberdeen Royal Infirmary (ARI).

The dual carriageway layout continues along Lang Stracht but the road narrows to a wide three lane or narrow four lane road west of the Fernhill Drive junction. There is a further narrowing of the road carriageway on the approach to and beyond the Maidencraig Drive junction. This single carriageway road continues to the Jessiefield roundabout junction with Skene Road and the A944. There are seven signalised junctions along Lang Stracht located at Summerhill Road/ Mastrick Drive, Stronsay Drive, Fernhill Drive, Springhill Road, Rousay Drive, Skye Road and Maidencraig Drive.

Lang Stracht includes short sections of inbound and outbound bus lane operating 7.30 – 9.30am and 4 - 6pm (Monday to Saturday). The inbound bus lanes are between Maidencraig Drive and Skye Road; Lewes Road and Rousay Drive; and Summerhill Road and Whitemyers Place while the outbound bus lanes are between Whitemyers Place and Springhill Road.

West of the Jessiefield roundabout the A944 is a dual carriageway road which continues to the Westhill Drive roundabout. This section includes major junctions at Fairly Road (roundabout), Kingswells Causeway

(signalised T), the AWPR (signalised roundabout), B9119 (signalised T) and Westhill Drive (roundabout). Bus access to the Kingswells Park & Ride is via Fairly Road.

West of the Westhill Drive roundabout the A944 becomes Straik Road which is a wide 40 mph single carriageway road which crosses the residential and employment extents of Westhill.

The following bus priority proposals were developed as part of the **A944/ A9119 multi-modal corridor study** as noted above. The proposed road layouts are provided in the Concept Design Report (Appendix A2 and A4) that accompanied the main report.

It should be noted that these designs considered three routes for bus services into the city centre from the end of Westburn Road i.e. the Berryden Road junction with Caroline Place and Hutcheon Street. Subsequent ART routing discussions with bus operators developed a forth option which is described above in Figure 8. As such, there is no concept design for the proposed ART route between the city centre and the Woolmanhill roundabout so as part of this study, assumptions have been made on what bus priority measures are achievable along these city streets.

Market Street, Guild Street, Bridge Street, Union Terrace
No bus lanes are proposed but it is expected bus services will get adaptive priority at all signalised junctions via SVD and UTC systems.

Rosemount Viaduct, Skene Street & Woolmanhill (outbound)
It is assumed the city centre traffic management strategy will keep this outbound route for ART services between Union Terrace and Gilcomston Steps via the Woolmanhill roundabout free flowing. No bus priority measures are therefore proposed.

Blackfriars Road & Union Street (inbound)
Again, it is assumed the city centre traffic management strategy will keep this inbound route for ART services between Gilcomston Steps and Union Terrace via the Woolmanhill roundabout free flowing. No bus priority measures are therefore proposed but this route does require a new 'bus only' link to be provided between the Woolmanhill roundabout and Blackfriars Road.

Gilcomston Steps & Skene Square
Skene Square forms part of the BCIP which proposes a dual carriage road from the Rosemount Place/ Maberly Street junction to Kittybrewster roundabout. Although the BCIP is included in the ASAM 19 future base model no bus lanes are proposed as it is assumed the BCIP scheme will create free flowing traffic conditions on this section of the corridor.

Rosemount Terrace
A bus gate is proposed at the northern end of the road at the junction with Westburn Road allowing ART services to short-cut the Berryden Road junction with Westburn Road. This will have an impact on the BCIP which allows Rosemount Terrace to be used by general traffic.

Westburn Road (Rosemount Terrace to Cairnfield Place)
The proposals introduce staggered bus lanes with an inbound bus lane between Watson Street and Rosemount Terrace and outbound bus lane between Watson Street and Argyll Place.

Westburn Road (Cairnfield Place to North Anderson Drive)
Continuous inbound and outbound bus lanes are proposed. These bus lanes extend up to stop lines at the Foresthill Road and North Anderson Drive junctions. A traffic gate is proposed at the end of the inbound bus lane near the Cairnfield Place junction with the intention of relocating traffic queues from the narrower downstream section of Westburn Road to the traffic lane next to the bus lane.

Lang Stracht
Continuous inbound and outbound bus lanes are proposed along the length of Lang Stracht which extends to the junction with Old Lang Stracht. To accommodate bus lanes up to stop lines requires road widening and a potential restriction to permitted vehicle turning movements at junctions. A set-back to the outbound bus lane on the approach to Summerhill Road junction is provided.

A944
Inbound and outbound bus lanes are proposed on the approaches all the key junctions on the A944 between the Jessiefield roundabout and the A9119 junction. This includes junctions at Fairley Road (roundabout),

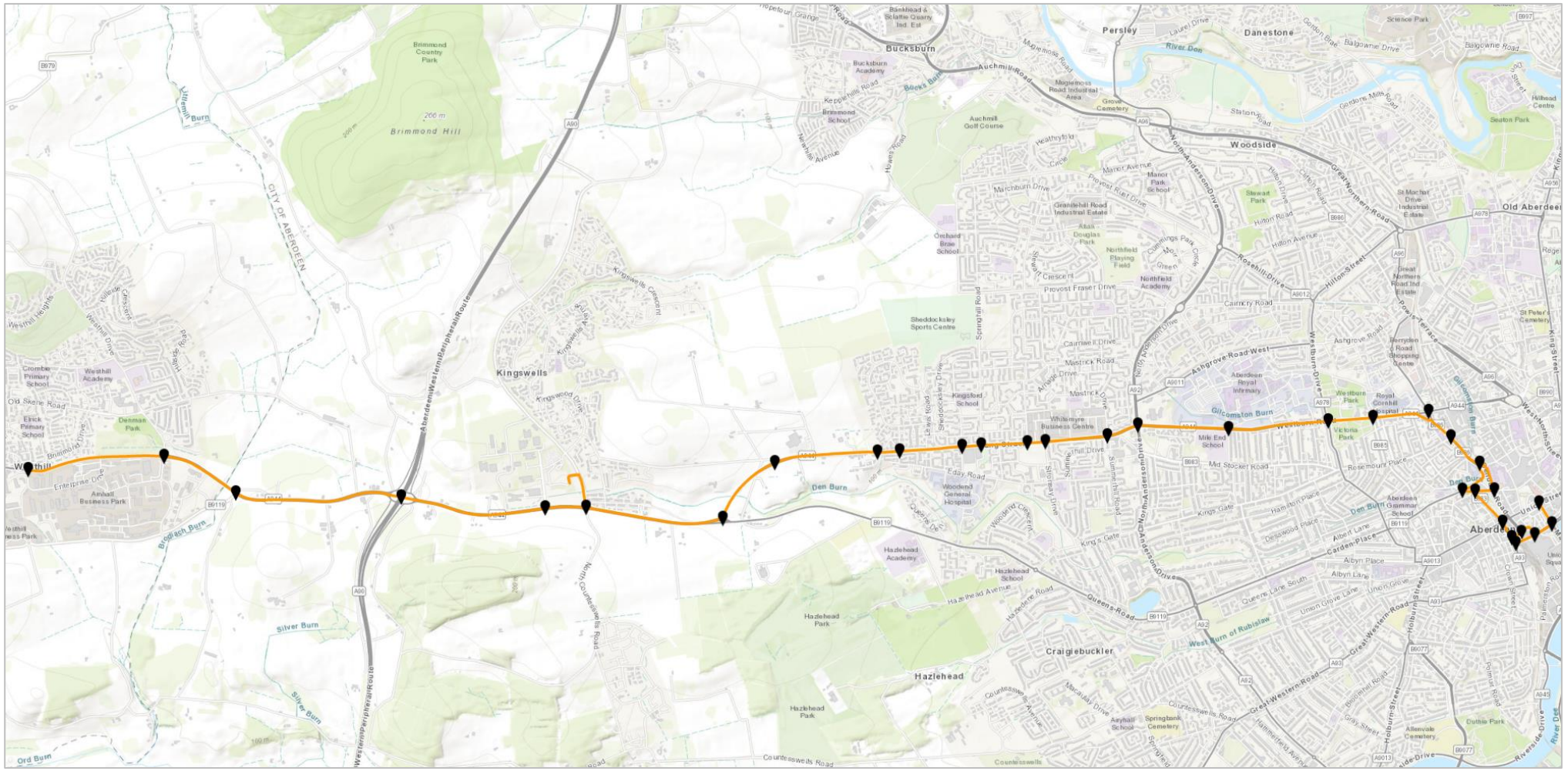
Kingswells Causeway (signalised T) and the AWPR (signalised roundabout). All bus lanes are set-back from the junctions. The end of the outbound bus lane on the approach to the Fairley Road junction is supported by pre-signals and bus advance area to assist bus drivers make the right turn and achieve quicker access to the Park & Ride site.

No bus lanes are proposed on the approaches to the A9119 (signalised T) or the Westhill Drive (roundabout) junctions.

Straik Road

No bus priority measures are proposed along Straik Road.

Figure 9: A944 corridor



A96

Description

The corridor (Figure 11) extends north-west of the city centre from Union Street along Broad Street, Gallowgate, Causewayend, Powis Place, Powis Terrace, Great Northern Road, Auchmill Road, Inverurie Road and A96 to the Park & Ride site at Craibstone.

Broad Street is 'bus only' except for the southern end while Gallowgate becomes a busier connector route providing access to shopping centre car parks. North of the Mounthooly roundabout, Causewayend and Powis Place are dual carriageway roads with no waiting at any time restrictions except for short sections of residential parking bays. This dual carriageway layout narrows north of the George Street/ Calsayseat Road junction which forms a key city centre access point for local bus services.

Powis Terrace is a wide single carriageway road with the adopted highway boundary constrained by residential frontages on one side and a railway line within a cutting on the other. There are two signalised junctions at Bedford Road and Belmont Road providing access to large areas of retail and employment.

North of Powis Terrace it is proposed ART services use the BCIP scheme that creates a new dual carriageway road between Clifton Road and Kittybrewster roundabout and which bypasses the existing section of the Great Northern Road between these two junctions.

The Great Northern Road between Kittybrewster Road and Printfield Walk near the Don Street junction is a wide single carriageway road with an on-street parking provision on both sides of the road. The road provides access to health care facilities and a community centre.

North of Printfield Walk the Great Northern Road becomes a dual carriageway road although the central reservation is broken to provide access to side roads. There are major junctions at Don Street (signalised T) and more critically the Haudagain roundabout although congestion levels are likely to have eased with the recent opening of the Haudagain bypass. In the outbound direction, there is a relatively long section of existing bus lane between Station Road and the Haudagain roundabout which operates 7.30 - 9.30am and 3.00 - 6.30pm (Monday to Saturday).

Auchmill Road has a similar dual carriageway layout to the Great Northern Road but with less frequent side roads. Key junctions include those at Auchmill Terrace (signalised T) and Old Meldrum Road (priority T). At the western end of Auchmill Road is the large Bucksburn roundabout which provides access to the residential and industrial areas in Dyce. In the inbound direction there is a bus lane between Auchmill Road and Haudagain roundabout which operates at any time.

West of the Bucksburn roundabout the A96 is a dual carriageway road layout with a more continuous central reservation. Key junctions include those at the Bankhead roundabout for access to large residential areas to the south and north; Gough Burn Crecent (signalised T) for access the TECA; and Dyce Drive (signalised cross-roads) and Craibstone roundabout for access to the Airport and the Kirkhill Industrial Estate. At the Gough Burn Crescent junction the right turn is bus only.

The roads that serve TECA, the Airport and Kirkhill Industrial Estate[2] are not part of the multimodal corridor studies so bus priority measures on these roads potentially needed to be developed as part of this study. As discussed later this was not required given the likely levels of congestion ART services would experience.

The following bus priority proposals were developed by the **A96 multi-modal corridor Preliminary Options Appraisal study** undertaken by Stantec, and reported in April 2022. This study developed a single concept design for the corridor between Inverurie and the Don Street/ Printfield Walk junction. South of the Printfield Walk junction, several designs were proposed to account for the Councils BCIP scheme but also consideration for more extensive road and bridge widening along Powis Terrace.

The BCIP scheme proposes a dual carriageway road between the Maberly Street/ Rosemount Terrace junction on Skene Square and the Kittybrewster roundabout using a combination of road widening and road building. The northern part of the scheme creates a new alignment to the A96 and which needed to be accounted for by the appraisal. In total five Route Variants where developed as part of the Preliminary Options Appraisal

[2] Gough Burn Crescent, Forrit Burn Road, Wellheads Drive, Dyce Drive, Argyll Road and Brent Road.

and the concept design proposed road layouts can be found in the Option Development Report (Appendices B and D) that accompanied the main report.

Four of the five Route Variants[3] where subsequently taken forward by the commission of the Detailed Options Appraisal study. This ongoing study has developed the proposed road layouts for the four Route Variants from a concept to outline level of design. For this study, Route Variant B was used for the southern section of the corridor as it utilised the BCIP but took a more cautious approach to road widening along Powis Terrace. A schematic of Route Variant B and the bus priority proposals is provided in Figure 10.

The overall traffic management strategy for the corridor was to maintain existing levels of highway capacity at junctions between the Craibstone roundabout and Haudagain bypass so general traffic could access the inner city bypass route provided by the A92 without significant additional delay. West of the Haudagain bypass junction, road space reallocation favoured bus priority, cycle route and walking infrastructure over general traffic capacity to create an attractive alternative to travelling to and from the city centre by car.

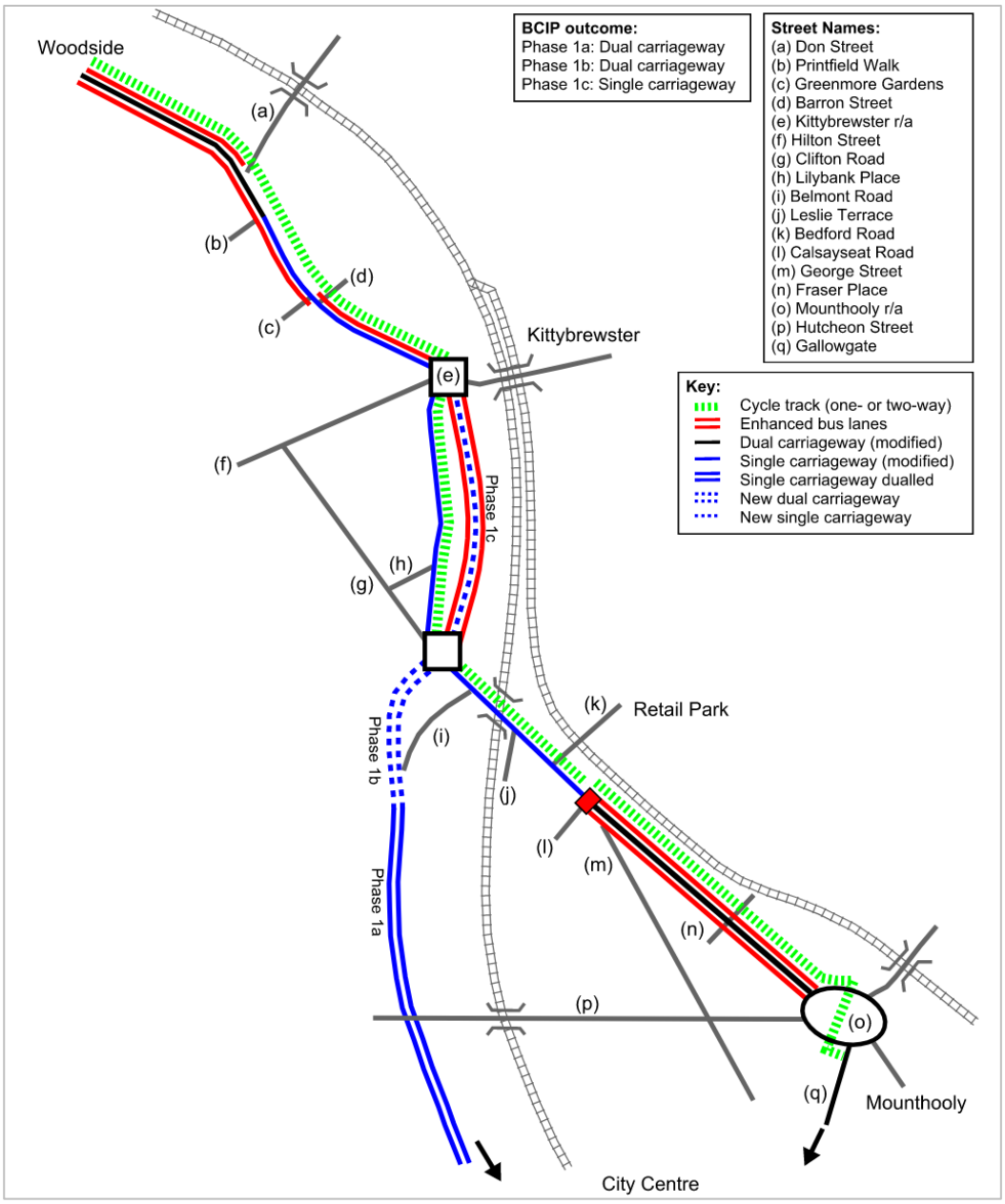


Figure 10: Schematic of bus priority measures along A96 (Don Street to Mounthooly)

[3] This included an additional Route Variant F proposed by the Council

Broad Street & Gallowgate

The existing bus gate on Broad Street would be retained to support ART services getting to and from Union Street. No bus priority measures are proposed along Gallowgate but as a key general traffic route to shopping centre and employment car parks, measures may need to be considered if congestion risks delaying ART services.

Causewayend & Powis Place

It is proposed to introduce inbound and outbound bus lanes using the nearside lane of the dual carriageway. The inbound bus lane on the approach to the Mounthooly roundabout would be set-back from the give-way road markings while the outbound bus lane would extend up to the stop line of the George Street junction. To ensure ART services maintain a steady speed/ consistent journey time northbound along Powis Terrace a traffic gating strategy is proposed at the George Street junction. Northbound traffic would be metered by traffic signals into Powis Terrace, ensuring Powis Terrace between its junctions with George Street and the BCIP junction at Clifton Road remained free flowing. This will require wider traffic management measures to remove rat-running routes but also co-ordinated traffic signals at the George Street, Bedford Road and Belmont Road junctions to ensure there is no net loss to capacity for general traffic i.e. the proposals effectively relocate any residue northbound queuing on Powis Terrace where it is not possible to introduce bus lanes to Powis Place where a bus lane can be accommodated.

Powis Terrace

A highway boundary constrained by residential frontages and the railway make it difficult to accommodate bus lanes and the required segregated cycle route. Bus delays will therefore be minimised using traffic signal control systems that use bus detection (southbound) and traffic gating (northbound) to ensure traffic including bus services keep moving.

New Berryden Road (Powis Terrace to Kittybrewster roundabout)

Inbound and outbound bus lanes are proposed within this new dual carriageway section of road, set-back from the Clifton Road (BCIP junction) and Kittybrewster roundabout respectively.

Great Northern Road (Kittybrewster roundabout to Don Street)

Bus lanes are provided on the approach to the Kittybrewster roundabout (inbound) and Don Street junction (outbound). The inbound bus lane is set-back from the roundabout while the outbound bus lane extends up to the Don Street stop line. The bus lanes are staggered i.e. they do not overlap but their length is considered sufficient to isolate bus services from the worst periods of traffic congestion.

Great Northern Road

With no significant junctions, continuous inbound and outbound bus lanes are proposed between Don Street and the Haudagain roundabout junctions. It is proposed to remove the Haudagain roundabout and replace it with a signal controlled crossroads. The inbound bus lane on the approach to this new junction will extend up to the junction stop line using a ‘hold the left’ method of traffic signal control.

Auchmill Road

As with Great North Road, continuous inbound and outbound bus lanes are proposed between the Haudagain bypass junction and the Bucksburn roundabout. At the Haudagain bypass and Auchmill Terrace junctions the inbound bus lanes continue through the junctions with both requiring the removal of a residential ‘service’ road on the opposite side of the road and the former requiring the highway boundary to be extended into an adjacent retail park. At the Bucksburn roundabout the A96 bypass lane is converted into an outbound bus lane with all general traffic required to pass through the roundabout give-ways.

Inverurie Road/ A96

The dual carriageway layout of Inverurie Road/ A96 between the Bucksburn and Craibstone roundabout junctions allow bus lanes to be implemented on both sides of the road. To maintain junction capacities for general traffic over this section of the corridor (as set out by the above corridor traffic management strategy), bus lanes where generally set-back from junctions including those at the Bankhead roundabout and Dyce Drive junctions. More ambitious measures were proposed at the Gough Burn Crescent junction where the outbound bus lane extended through the junction and inbound bus lane up to the junction stop line. This was achieved by road widening and removing the left turn into Gough Burn Crescent but a traffic modeling assessment is required to understand if this junction layout would provide sufficient capacity for general traffic compared to the next upstream and downstream junctions at Dyce Drive and the Bankhead roundabout.

Airport Road, Argyll Road & Brent Road

These roads connect the Craibstone P&R site with the Airport and Kirkhill Industrial Estate. Airport Road is a dual carriageway road while Argyll Road and Brent Road are single carriageway roads only used by Airport traffic. There is unlikely to be significant levels of traffic congestion on these roads so no bus priority measures are proposed.

Dyce Drive, Wellheads Drive, Forrit Burns Road & Gough Burn Crescent

These dual carriageway roads serve the Airport, southern parts of the Kirkhill Industrial Estate and TECA. As such these roads are unlikely to experience significant levels of traffic congestion so no bus priority measures are proposed.

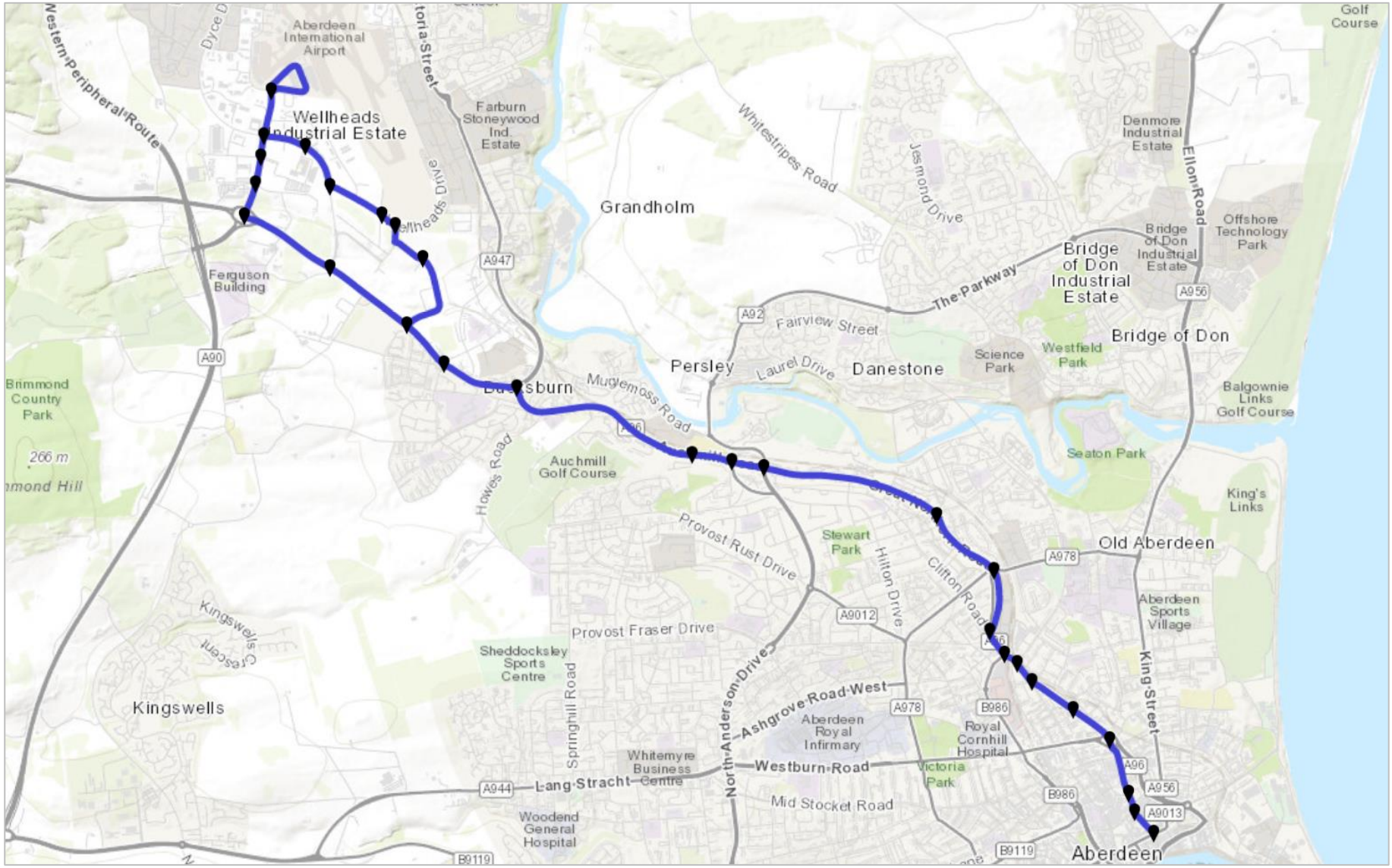


Figure 11: A96 corridor

Summary

Ongoing work to establish the most appropriate routeing for the Aberdeen Rapid Transit (ART) project included a routeing analysis assessment. This routeing analysis[4] developed ten ART route tests for assessment in Aberdeen Sub Area Model (ASAM19) to help understand the preferred routing and therefore network for ART services.

In addition to the routeing of ART services, the ASAM19 assessment required the following information:

- Bus priority measures along each corridor that would provide ART with an efficient operating environment, one that isolated services from general traffic congestion
- Changes to the local bus network required to ensure bus services on the ART and existing local bus networks are co-ordinated i.e. avoid significant overlap of local bus services

This note summarises the bus priority infrastructure and measures assumed in ASAM19 to assess the ART route tests. The information was extracted from the latest STAG based multi-modal corridor studies commissioned by Aberdeen City Council:

- Ellon Park & Ride to Garthdee Transport Corridor Study. STAG Detailed Options Appraisal, Preliminary Design, Parallel Routes, Main Corridor (Appendix C). Aecom, May 2023
- A92 Wellington Road Multi-modal Corridor Study. STAG Detailed Options Appraisal, Multimodal Travel and Transport Package (Appendix A), Aecom, 2021
- A944 - A9119 Multi-modal Corridor Study. STAG Detailed Options Appraisal. Concept Design Report (Appendix A6). Stantec, July 2022
- A96 Multi-modal Corridor Study. STAG Case for Change & Preliminary Options Appraisal. Concept Design Report (Appendix B and Appendix D). Stantec, April 2023
- A96 Multi-modal Corridor Study. STAG Detailed Options Appraisal. Outline Design Report (Appendix A). Stantec, April 2024

For sections of the ART route tests that were not included in the above corridor studies, this study developed high level bus priority proposals to ensure all corridors provided ART services with a suitable operating environment but which reflected the constraints of the highway.

To support the ASAM19 assessment of the ten ART route tests the following bus priority information was provided.

- **Bus lanes**: Location, length and set-back length. It was assumed operational hours covered the full length of the modelled periods
- **Junction layouts**: The traffic lane designation at junction stop lines for the existing and proposed road layouts allowing ASAM 19 to account for the potential strategic general traffic capacity impacts of the proposals (Appendix A)
- **Signalised junctions**: A modified method of signal control would provide bus services with 'green wave' adaptive priority on the approach to and through junctions using SVD and appropriate UTC system (e.g. SCOOT, MOVA, Vehicle Attenuation)
- **Traffic gating**: Queue relocation to assist bus service progression along sections of corridor where it was not possible to implement bus lanes
- **Bus stops**. Bus stops spacing was rationalised along the ART routes to reduce the time penalty resulting from vehicle deceleration and acceleration before and after the bus stop

The intention is that this note could be updated as the highways designs along the bus priority corridors develop and with this more detailed description of the bus priority infrastructure achievable along each corridor, support a further testing of the ART network in ASAM19.

[4] Aberdeen Rapid Transit - Routeing Analysis - Report (Stantec, May 2024)

Appendix A: Junction Lane Designation Assessment

Contents

A956/ A92 (South)

Junction Number	Location	Direction		Junction Type	EXISTING Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	PROPOSED Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Comments	Drawing Number (1)
1	Union Street/ Castle Street - King Street	NB	Outbound	Signalised	0	0	1	0	1	0	0	Signalised	tbc	tbc	tbc	tbc	tbc	tbc	tbc	Cross reference with Beach Boulevard changes - see email from Keith McGillivray	tbc
1	Union Street/ Castle Street - King Street	SB	Inbound	Signalised	0	0	1	0	0	0	1	Signalised	tbc	tbc	tbc	tbc	tbc	tbc	tbc	Cross reference with Beach Boulevard changes - see email from Keith McGillivray	tbc
2	**King Street** - West North Street	NB	Outbound	Signalised	0	1	0	0	1	0	0	Signalised	0	1	0	0	1	0	0	No change but scheme to tie into City Centre masterplan proposals on this side of the junction	60685454-SHT-C-ELLON_GDEE-0008
2	**King Street** - West North Street	SB	Inbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. SB bus lane set back from junction	
3	**King Street** - Mounthooly Way - Seaforth Road	NB	Outbound	Signalised	0	0	0	0	0	1.5	0	Signalised	1	0	0	1	0	0	0	NB bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0009
3	**King Street** - Mounthooly Way - Seaforth Road	SB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. SB bus lane set back from junction	
4	**King Street** - Orchard St - Linksfield Rd	NB	Outbound	Signalised	1	0	0	1	0	0	0	Signalised	1	0	1	0	0	0	0	Existing NB bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0010
4	**King Street** - Orchard St - Linksfield Rd	SB	Inbound	Signalised	0	0	0	0	0	1	0	Signalised	1	0	0	1	0	0	0	SB bus lane set back from junction	
5	**King Street** - Regent Walk	NB	Outbound	Signalised	1	0	0	1	0	0	0	Signalised	1	0	0	1	0	0	0	No change. Existing NB bus lane set back from junction (short)	60685454-SHT-C-ELLON_GDEE-0011
5	**King Street** - Regent Walk	SB	Inbound	Signalised	0	0	0	0	0	1	0	Signalised	1	0	0	1	0	0	0	SB bus lane set back from junction (short)	
6	**King Street** - St Machar Drive	NB	Outbound	Roundabout	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	Roundabout removed. Existing NB bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0011/12
6	**King Street** - St Machar Drive	SB	Inbound	Roundabout	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	Roundabout removed. SB bus lane set back from junction	
7	**King Street** - Don Street	NB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	0	1	0	0	0	0	0	2-way cycle track up to junction stop line. MoC uncertain	60685454-SHT-C-ELLON_GDEE-0012
7	**King Street** - Don Street	SB	Inbound	Signalised	0	0	0	1.5	0	0	0	Signalised	0	0	0	1	0	0	1	Bus lane up to junction stop line. Right turn into Don Street allowed?	
8	**King Street** - Lidl	NB	Outbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	0	0	0	0	0	2-way cycle track up to junction stop line. MoC uncertain. NB bus lane removed	60685454-SHT-C-ELLON_GDEE-0013
8	**King Street** - Lidl	SB	Inbound	Signalised	0	0	1	1	0	0	0	Signalised	0	0	0	1	0	0	1	SB bus lane up to junction stop line. Right turn into Lidl allowed?	
9a/b	**King Street** - Esplanade	NB	Outbound	Signalised	0	0	2	0	0	0	0	Signalised	0	0	2	0	0	0	0	2-way cycle track up to junction stop line. NB bus lane removed	60685454-SHT-C-ELLON_GDEE-0013
9a/b	**King Street** - Esplanade	SB	Inbound	Signalised	1	0	1	0	0	0	1	Signalised	1	0	1	0	0	0	1	No change. Existing SB bus lane set back from junction but feeds into bus gate at junction stop line	
10	**Ellon Road** - Balgownie Road - Links Road	NB	Outbound	Signalised	0	1	0	1	0	0	0	Signalised	0	0	0	0	0	1	0	2-way cycle track up to junction stop line. MoC uncertain. Traffic all red required to accommodate pedestrian crossing facility	60685454-SHT-C-ELLON_GDEE-0014
10	**Ellon Road** - Balgownie Road - Links Road	SB	Inbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	SB bus lane set back from junction. All red for traffic to accommodate pedestrian crossing facility	
11	**Ellon Road** - N Donside Rd - King Robert's Way	NB	Outbound	Roundabout	1	0	2	0	1	0	0	Signalised	1	0	1	1	0	0	0	Roundabout to signalised cross-roads conversion. NB bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0015
11	**Ellon Road** - N Donside Rd - King Robert's Way	SB	Inbound	Roundabout	0	1	1	1	0	0	0	Signalised	1	0	1	1	0	0	0	Roundabout to signalised cross-roads conversion. SB bus lane set back from junction	
12	**Ellon Road** - The Parkway	NB	Outbound	Roundabout	0	1	0	1	0	0	0	Signalised	1	0	2	1	0	0	0	NB bus lane set back from junction. If ART services turn right into Parkway East buses in the bus lane would need to move across 2 ahead traffic lanes to access the right turn.	60685454-SHT-C-ELLON_GDEE-0016
12	**Ellon Road** - The Parkway	SB	Inbound	Roundabout	1	0	1	1	0	0	1	Signalised	1	0	2	0	1	0	1	SB bus lane set back from junction but feeds into bus gate at junction stop line	
13	**Parkway East** - Exhibition Avenue	NB	Outbound	Roundabout	1	0	1	1	0	0	0	Roundabout	1	0	1	1	0	0	0	No change. Assumes access to P&R site does not change	tbc
13	Parkway East - **Exhibition Avenue**	SB	Inbound	Roundabout	0	0	0	0	0	1.5	0	Roundabout	0	0	0	0	0	1.5	0	No change. Assumes access to P&R site does not change	
14	**Ellon Road** - B999 - Berryhill Crescent	NB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change	tbc
14	**Ellon Road** - B999 - Berryhill Crescent	SB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change	
15	A92 - A90 (Blackdog Roundabout)	NB	Outbound	Roundabout	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Roundabout	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No change	tbc
15	A92 - A90 (Blackdog Roundabout)	SB	Inbound	Roundabout	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Roundabout	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No change	

Notes
1 Drawings can be found in 'Aecom - Ellon P&R-Garthdee Detailed Appraisal (Appendix C)

Beach Boulevard

Junction Number	Location	Direction		EXISTING Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	PROPOSED Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Comments	Drawing Number (1)
1	Union Street/ Castle Street - King Street	NB	Outbound	Signalised	0	0	1	0	1	0	0	Signalised	tbc	tbc	tbc	tbc	tbc	tbc	tbc	Cross reference with Beach Boulevard changes - see email	tbc
1	Union Street/ Castle Street - King Street	SB	Inbound	Signalised	0	0	1	0	0	0	1	Signalised	tbc	tbc	tbc	tbc	tbc	tbc	tbc	from Keith McGillivray at Systra	tbc
2	**King Street** - West North Street	NB	Outbound	Signalised	0	1	0	0	1	0	0	Signalised	0	1	0	0	1	0	0	No change	tbc
2	King Street - West North Street	SB	Inbound	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Inbound or SB ART services do not use this junction	tbc
3	Castle Street - Justice Street	NB	Outbound	No Junction	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Bus Gate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Outbound or NB ART services do not use this junction	tbc
3	Castle Street - **Justice Street**	SB	Inbound	No Junction	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Bus Gate	0	0	0	0	0	0	1	No change	tbc
4	**West North Street** - Beach Boulevard - Justice Street	NB	Outbound	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change. Outbound ART services only	tbc
4	West North Street - Beach Boulevard - **Justice Street**	SB	Inbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change. Inbound ART services only	tbc
5	**Beach Boulevard** - Links Road	NB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change	tbc
5	Beach Boulevard - **Links Road**	SB	Inbound	Signalised	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	No change	tbc
6	**Links Road** - Urquhart Road	NB	Outbound	Signalised	0	0	1	1	0	0	0	Signalised	0	0	1	1	0	0	0	No change	tbc
6	**Links Road** - Urquhart Road	SB	Inbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	No change	tbc
7	**Links Road -** Esplanade	NB	Outbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change	tbc
7	**Links Road -** Esplanade	SB	Inbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change	tbc

Notes
1 To be confirmed by City Centre and Beachfront Masterplan

A956 (South)

Junction Number	Location	Direction		EXISTING Junction Type	Left only	Ahead + Left	Ahead	Ahead + Right	Right Only	All	Bus Lane	PROPOSED Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Comments	Drawing Number (1)
1	Market Street - **Union Street**	SB	Outbound	Signalised	1	0	0	0	0	0	1	Signalised	1	0	0	0	0	0	1	No change. Need to track an ART vehicle turning left from the nearside lane.	tbc
1	**Market Street** - Union Street	NB	Inbound	Signalised	1	0	0	0	1	0	0	Signalised	1	0	0	0	1	0	0	No change	tbc
2	**Market Street** - Guild Street	SB	Outbound	Signalised	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	No change	tbc
2	**Market Street** - Guild Street	NB	Inbound	Signalised	1	0	0	1	1	0	0	Signalised	1	0	0	1	1	0	0	No change	tbc
3	**Market Street** - Bus Station	SB	Outbound	Signalised	0	0	2	0	1	0	0	Signalised	0	0	2	0	1	0	0	No change	tbc
3	**Market Street** - Bus Station	NB	Inbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	No change	tbc
4	**Market Street** - Commercial Quay	SB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change	tbc
4	**Market Street** - Commercial Quay	NB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change	tbc
5	**Market Street** - Palmerston Road	SB	Outbound	Signalised	0	0	2	0	0	0	0	Signalised	0	0	2	0	0	0	0	No change	tbc
5	**Market Street** - Palmerston Road	NB	Inbound	Signalised	0	0	2	0	0	0	0	Signalised	0	0	2	0	0	0	0	No change	tbc
6	**Market Street** - Albert Quay	SB	Outbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	No change	tbc
6	**Market Street** - Albert Quay	NB	Inbound	Signalised	0	0	2	0	1	0	0	Signalised	0	0	2	0	1	0	0	No change	tbc
7	N Esplanade W/E - **Market Street** - Victoria Road	SB	Outbound	Signalised	0	1	0	0	2	0	0	Signalised	0	1	0	0	2	0	0	No change	tbc
7	N Esplanade W/E - Market Street - **Victoria Road**	NB	Inbound	Signalised	1	0	2	0	1	0	0	Signalised	1	0	2	0	1	0	0	No change	tbc
8	**Victoria Road** - Menzies Road	SB	Outbound	Signalised	0	0	1	0	1	0	0	Signalised	0	0	1	0	1	0	0	No change. Potential delay point for buses. Bus priority measures tbc. Potential for southbound ART services to use S Esplanade West	tbc
8	Victoria Road - **Menzies Road**	NB	Inbound	Signalised	0	0	0	0	0	0	1	Signalised	0	0	0	0	0	0	1	No change. NB contra-flow bus lane up to junction stop line	tbc
9	Wellington Road - Bridge - **Craig Place/ Menzies Road**	SB	Outbound	Roundabout	1	0	0	0	1	0	0	Roundabout	1	0	0	0	1	0	0	No change. Potential for bus delay on approach to the roundabout. Menzies Road too narrow for a bus lane a SB bus lane	60597273-MOD-C-MMTT-001
9	**Wellington Road** - Bridge - Craig Place/ Menzies Road	NB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. NB bus lane proposed set-back from junction	60597273-MOD-C-MMTT-001
10	**Wellington Road** - Balnagask Road	SB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. SB bus lane proposed (requiring road widening) with short set-back from the junction	60597273-MOD-C-MMTT-001/ 002
10	**Wellington Road** - Balnagask Road	NB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. NB bus lane proposed (using existing road space) with a long set back from the junction to maximise stacking capacity.	60597273-MOD-C-MMTT-002
11	**Wellington Road** - Abbotswell Road	SB	Outbound	Signalised	0	0	1	1	0	0	0	Signalised	0	0	1	1	0	0	0	No change. SB bus lane proposed (using existing road space) up to junction stop line with break to accommodate Girdleness Road	60597273-MOD-C-MMTT-002
11	**Wellington Road** - Abbotswell Road	NB	Inbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	No change. NB bus lane proposed (using existing road space) set-back from the junction	60597273-MOD-C-MMTT-002
12	**Wellington Road** - Greenbank Road	SB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. SB bus lane proposed (using existing road space) set-back from the junction	60597273-MOD-C-MMTT-003
12	**Wellington Road** - Greenbank Road	NB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. NB bus lane proposed (using existing road space) set-back from the junction.	60597273-MOD-C-MMTT-003
13	**Wellington Road** - Craigshaw Drive - Altens Farm Road	SB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. SB bus lane proposed (using existing road space) set-back from the junction	60597273-MOD-C-MMTT-003
13	**Wellington Road** - Craigshaw Drive - Altens Farm Road	NB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. NB bus lane (using existing road space) set-back from the junction	60597273-MOD-C-MMTT-004
14	**Wellington Road** - West Tullos Road - Hareness Road	SB	Outbound	Roundabout	1	0	1	1	0	0	0	Roundabout	1	0	1	1	0	0	0	No change. SB bus lane proposed (using existing road space) set-back from the junction	60597273-MOD-C-MMTT-004
14	**Wellington Road** - West Tullos Road - Hareness Road	NB	Inbound	Roundabout	1	0	1	1	0	0	0	Roundabout	1	0	1	1	0	0	0	No change. NB bus and freight lane proposed by Sweco (using existing road space) set-back from the junction. All pedestrian crossings at the roundabout will be signalised.	60597273-MOD-C-MMTT-005/ 006
15	**Wellington Road** - Souter Head Road	SB	Outbound	Roundabout	1	0	1	1	0	0	0	Roundabout	1	0	1	1	0	0	0	No change. SB bus lane proposed (using existing road space) set-back from the junction. All pedestrian crossings at the roundabout will be signalised under the Sweco proposals	60597273-MOD-C-MMTT-005/ 006
15	**Wellington Road** - Souter Head Road	NB	Inbound	Roundabout	0	1	1	0	1	0	0	Roundabout	0	1	1	0	1	0	0	No change. NB bus and freight lane proposed by Sweco set-back from the junction. All pedestrian crossings at the roundabout will be signalised.	
16	**Wellington Road** - Charleston Road N - Wellington Circle	SB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. Potential bus lane (using existing road space) set-back from the junction. **Not part of the Aecom A92 study**	
16	**Wellington Road** - Charleston Road N - Wellington Circle	NB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. Potential bus lane (using existing road space) set-back from the junction. **Not part of the Aecom A92 study**	
17	**Wellington Road** - A956	SB	Outbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	No change	
17	**Wellington Road** - A956	NB	Inbound	Signalised	1	0	0	0	1	0	0	Signalised	1	0	0	0	1	0	0	No change	
18	**Wellington Road** - Gateway Drive	SB	Outbound	Roundabout	0	0	1	0	0	0	0	Roundabout	0	0	1	0	0	0	0	No change. Potential bus lane (requiring road widening) set-back from junction. **Not part of the Aecom A92 study**	
18	**Wellington Road** - Gateway Drive	NB	Inbound	Roundabout	0	0	1	0	0	0	0	Roundabout	0	0	1	0	0	0	0	No change. Potential bus lane (requiring road widening) set-back from junction. **Not part of the Aecom A92 study**	
19	**Wellington Road** - Old Stonehaven Road	SB	Outbound	Roundabout	1	0	0	1	0	0	0	Roundabout	1	0	0	1	0	0	0	No change	
19	**Wellington Road** - Old Stonehaven Road	NB	Inbound	Roundabout	1	0	0	1	0	0	0	Roundabout	1	0	0	1	0	0	0	No change	
20a	Findon Junction (Old Stonehaven Road - Redmoss Road)	SB	Outbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change. Potential for bus service delay given the single lane approach to the roundabout.	
20a	Findon Junction (Old Stonehaven Road - Redmoss Road)	NB	Inbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change. Potential for bus service delay given the single lane approach to the roundabout.	
20b	Findon Junction	WB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change	
20b	Findon Junction	NB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change	

Notes
1 Drawings can be found in 'Aecom - A92 Wellington Preliminary Appraisal (Appendix A)'
2 Proposals for the Souterhead and Hareness roundabouts taken from the Sweco DMRB Stage 2 report (Option K)

Project: ART - Detailed Options Appraisal
Technical Note A: Bus Priority Infrastructure - Junction Stop Line Lane Designations (Appendix A)

B9077 and West Tullos Road

Junction Number	Location	Direction		EXISTING							PROPOSED							Comments	Drawing Number (1)
				Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane		
1	**Holborn Street** - Fonthill Road - Great Southern Road (B9077)	SB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. SB bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0007
1	Holborn Street - Fonthill Road - **Great Southern Road (B9077)**	NB	Inbound	Roundabout	1	0	0	1	0	0	0	Roundabout	1	0	0	1	0	0	0	No change. NB bus lane set back from junction	
2	**Great Southern Road (B9077)** - Whinhill Road	SB	Outbound	Roundabout	1	0	1	0	0	0	0	Roundabout	1	0	1	0	0	0	0	No change. SB bus lane set back from junction	tbc
2	**Great Southern Road (B9077)** - Whinhill Road	NB	Inbound	Roundabout	1	0	1	0	0	0	0	Roundabout	1	0	1	0	0	0	0	No change. NB bus lane set back from junction	
3	**Great Southern Road (B9077)** - Riverside Drive	SB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. SB bus lane set back from junction	tbc
3	**Great Southern Road (B9077)** - Riverside Drive	NB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. NB No bus lane proposed for the bridge	
4	**Great Southern Road (B9077)** - West Tullos Road - Provost Watt Drive	SB	Outbound	Roundabout	1	0	1	1	0	0	0	Roundabout	1	0	1	1		0	0	No change. SB No bus lane proposed for the bridge	tbc
4	Great Southern Road (B9077) - **West Tullos Road** - Provost Watt Drive	NB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. NB bus lane set back from junction	
5	**West Tullos Road** - Abbotswell Road	SB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. SB bus lane set back from junction	tbc
5	**West Tullos Road** - Abbotswell Road	NB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. NB bus lane set back from junction	
6	**West Tullos Road** - Wellington Road - Hareness Road	SB	Outbound	Roundabout	0	1	0	1	1	0	0	Roundabout	0	1	0	1	1	0	0	No change. SB bus lane set back from junction	tbc
6	West Tullos Road - **Wellington Road** - Hareness Road	NB	Inbound	Roundabout	1	0	1	1	0	0	0	Roundabout	1	0	1	1	0	0	0	No change. NB bus and freight lane set back from junction	

Notes

1 Drawings can be found in the 'Aecom - Ellon P&R-Garthdee Detailed Appraisal (Appendix C)

Project: ART - Detailed Options Appraisal
Technical Note A: Bus Priority Infrastructure - Junction Stop Line Lane Designations (Appendix A)

A9013

Junction Number	Location	Direction		EXISTING Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	PROPOSED Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Comments	Drawing Number (1)
1	**Union Street** - Union Terrace	SB	Outbound	Signalised	1	0	1	0	1	0	0	Signalised	1	0	1	0	1	0	0	Assume Union Street SfP scheme has been removed	tbc
1	**Union Street** - Union Terrace	NB	Inbound	Signalised	1	0	1	0	1	0	0	Signalised	1	0	1	0	1	0	0		
2	**Union Street** - Silver Street/ Crown Street	SB	Outbound	Signalised	1	0	1	0	1	0	0	Signalised	1	0	1	0	1	0	0	No change. Check against City Centre masterplan	tbc
2	**Union Street** - Silver Street/ Crown Street	NB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0		
3	**Union Street** - Union Row/ Bon-Accord Street	SB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. Check against City Centre masterplan	tbc
3	**Union Street** - Union Row/ Bon-Accord Street	NB	Inbound	Signalised	0	0	1	0	1	0	1	Signalised	0	0	1	0	1	0	1		
4	**Union Street** - Chapel Street	SB	Outbound	Signalised	0	0	1	0	0	0	1	Signalised	0	0	1	0	0	0	1	No change. Check against City Centre masterplan	tbc
4	**Union Street** - Chapel Street	NB	Inbound	Signalised	0	0	1	0	0	0	1	Signalised	0	0	1	0	0	0	1		
5	**Union Street** - Rose Street	SB	Outbound	Signalised	0	0	2	0	1	0	0	Signalised	0	0	2	0	1	0	0	No change. Check against City Centre masterplan	tbc
5	**Union Street** - Rose Street	NB	Inbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0		
6	**Union Street** - Alford Place	SB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. Check against City Centre masterplan	60685454-SHT-C-ELLON_GDEE-0008
6	**Union Street** - Alford Place	NB	Inbound	Signalised	0	1	1	0	0	0	0	Signalised	1	0	1	0	0	0	1	NB bus lane set back from junction	
7	**Holborn Street** - Great Western Road	SB	Outbound	Signalised	0	1	0	1	0	0	0	Signalised	1	0	0	1	0	0	0	SB bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0007
7	**Holborn Street** - Great Western Road	NB	Inbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	0	1	0	0	0	Existing NB bus set back from junction	
8	**Holborn Street** - Fonthill Road - Great Southern Road	SB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. Bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0007
8	**Holborn Street** - Fonthill Road - Great Southern Road	NB	Inbound	Roundabout	0	0	1	1	0	0	0	Roundabout	1	0	0	1	0	0	0	New NB bus lane to bypass roundabout	
9	**Holborn Street** - Broomhill Road - Holburn Road	SB	Outbound	Roundabout	1	0	0	1	0	0	0	Signalised	0	0	1	0	1	0	0	Roundabout removal and replaced with a signal controlled junction with controlled pedestrian crossings on all arms	60685454-SHT-C-ELLON_GDEE-0006
9	**Holborn Street** - Broomhill Road - Holburn Road	NB	Inbound	Roundabout	0	1	0	0	1	0	0	Signalised	1	0	1	0	0	0	0		
10	**Holborn Street** - Garthdee	SB	Outbound	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change. Existing SB bus lane set back from junction	60685454-SHT-C-ELLON_GDEE-0004
10	**Holborn Street** - Garthdee	NB	Inbound	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change	
11	**Garthdee Road** - ASDA access	SB	Outbound	Roundabout	0	0	1	0	1	0	0	Roundabout	0	0	1	0	1	0	0	No change	60685454-SHT-C-ELLON_GDEE-0003
11	**Garthdee Road** - ASDA access	NB	Inbound	Roundabout	0	1	1	0	0	0	0	Roundabout	0	1	1	0	0	0	0	No change	
12	**Garthdee Road** - B&Q access	SB	Outbound	Roundabout	1	0	1	0	0	0	0	Roundabout	0	0	0	0	0	1	0	The 2-way cycle track on the eastern side of road reduced the approach to a single lane on each approach	60685454-SHT-C-ELLON_GDEE-0003
12	**Garthdee Road** - B&Q access	NB	Inbound	Roundabout	0	0	1	0	1	0	0	Roundabout	0	0	0	0	0	1	0		
13	**Garthdee Road** - David Lloyd access	SB	Outbound	Signalised	0	1	0	0	0	0	0	Signalised	0	1	0	0	0	0	0	No change	60685454-SHT-C-ELLON_GDEE-0002
13	**Garthdee Road** - David Lloyd access	NB	Inbound	Signalised	0	0	1	0	1	0	0	Signalised	0	0	0	1	0	0	0	The 2-way cycle track on the southern side of the road reduced the NB approach to a single lane	
14	**Garthdee Road** - Scott Cassie Circuit	WB	Outbound	Signalised	0	1	0	0	0	0	0	Signalised	0	1	0	0	0	0	0	No change	60685454-SHT-C-ELLON_GDEE-0002
14	**Garthdee Road** - Scott Cassie Circuit	EB	Inbound	Signalised	0	0	1	0	1	0	0	Signalised	0	0	0	1	0	0	0	The 2-way cycle track on the southern side of the road reduced the EB approach to a single lane	
15	**Garthdee Road** - Riverside East	WB	Outbound	Signalised	0	1	0	0	0	0	0	Signalised	0	1	0	0	0	0	0	No change. The priority right turn pocket is removed	60685454-SHT-C-ELLON_GDEE-0001
15	**Garthdee Road** - Riverside East	EB	Inbound	Signalised	0	0	1	0	1	0	0	Signalised	0	0	0	1	0	0	0	The 2-way cycle track on the southern side of the road reduced the EB approach to a single lane	
16	**Garthdee Road** - Auchinyell Road	WB	Outbound	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No change. End of ART route	60685454-SHT-C-ELLON_GDEE-0001
16	**Garthdee Road** - Auchinyell Road	EB	Inbound	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No change. End of ART route	

Notes
1 Drawings can be found in the 'Aecom - Ellon P&R-Garthdee Detailed Appraisal (Appendix C)'

Project: ART - Detailed Options Appraisal
Technical Note A: Bus Priority Infrastructure - Junction Stop Line Lane Designations (Appendix A)

A9119

Junction Number	Location	Direction	EXISTING								PROPOSED							Comments	Drawing Number (1)
			Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	
1	**Union Street** - Alford Place	WB	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. Check against City Centre masterplan	Note 1
1	Union Street - **Alford Place**	EB	Signalised	0	0	1	1	0	0	0	Signalised	0	0	1	1	0	0	0	No change. EB bus lane proposed set back from junction	
2	**Albyn Place** - Queen's Road (Queen's Cross)	WB	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change. WB bus lane set back from roundabout	Note 1
2	Albyn Place - **Queen's Road (Queen's Cross)**	EB	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change. EB bus lane set back from roundabout	
3	**Queen's Road** - Forest Road - Forest Avenue (Queen's Gate)	WB	Roundabout	0	0	0	0	0	1	0	Signalised	0	1	0	0	1	0	0	WB bus lane set back from new signalised junction	Note 1
3	**Queen's Road** - Forest Road - Forest Avenue (Queen's Gate)	EB	Roundabout	0	0	0	0	0	1	0	Signalised	0	1	0	0	1	0	0	EB bus lane set back from new signalised junction	
4	**Queen's Road** - Anderson Drive	WB	Roundabout	0	1	0	1	0	0	0	Signalised	0	1	0	0	1	0	0	WB bus lane set back from new signalised junction	Note 1
4	**Queen's Road** - Anderson Drive	EB	Roundabout	0	1	1	0	1	0	0	Signalised	0	1	0	0	1	0	0	Existing EB bus lane set back from new signalised junction	
5	**Queen's Road** - Queen's Parade	WB	Signalised	0	1	0	0	0	0	0	Signalised	1	0	1	0	0	0	0	Increased to two lanes with 'left only' except buses	Note 1
5	**Queen's Road** - Queen's Parade	EB	Signalised	0	0	0	1	0	0	1	Signalised	0	0	0	1	0	0	1	No change	
6	**Queen's Road** - Hill of Rubislaw	WB	Signalised	0	0	1	0	1	0	0	Signalised	0	0	1	0	1	0	0	No change. WB bus lane set back from junction	Note 1
6	**Queen's Road** - Hill of Rubislaw	EB	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	Left turn except buses to facilitate access to bus stop	
7	**Queen's Road** - Springfield Road	WB	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change. WB bus lane set back from junction	Note 1
7	**Queen's Road** - Springfield Road	EB	Signalised	0	0	1	0	1	0	0	Signalised	0	0	1	0	1	0	0	No change. EB bus lane set back from junction	
8	**Queen's Road** - Kings Gate	WB	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change. WB bus lane set back from junction	Note 1
8	**Queen's Road** - Kings Gate	EB	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change. Existing EB bus lane set back from junction	
9	**Queens Road** - Provost Graham Avenue	WB	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change	Note 1
9	**Queens Road** - Provost Graham Avenue	EB	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change	
10	**Queen's Road** - Groats Road - Skene Road	WB	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change. WB bus lane set back from junction	Note 1
10	**Queen's Road** - Groats Road - Skene Road	EB	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change. EB existing bus lane set back from junction	
11	**Skene Road** - Cemetery Access	WB	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change	Note 1
11	**Skene Road** - Cemetery Access	EB	Signalised	0	0	1	0	1	0	0	Signalised	0	0	1	0	1	0	0	No change	
12	**Skene Road** - Lang Stracht - A944 (Jessiefield Roundabout)	WB	Roundabout	0	0	1	1	0	0	0	Roundabout	0	0	0	1	0	0	1	Bypass lane converted to a bus lane	Note 1
12	Skene Road - Lang Stracht - **A944** (Jessiefield Roundabout)	EB	Roundabout	1	0	1	0	0	0	0	Roundabout	1	0	1	0	0	0	0	WB bus lane set back from roundabout	

Notes

1 Concept designs can be found in 'Stantec - A944/ A9119 Detailed Appraisal Concept Design (Appendix A - Corridor III)'

1 These designs show only concept layouts for links produced as part of the A944/ A9119 STAG Detailed Appraisal. Junction layouts to be confirmed at the next Design (Outline) stage.

Project: ART - Detailed Options Appraisal
Technical Note A: Bus Priority Infrastructure - Junction Stop Line Lane Designations (Appendix A)

A944

Junction Number	Location	Direction		EXISTING Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	PROPOSED Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Comments	Drawing Number (1)
1	Market Street - **Union Street**	SB	Outbound	Signalised	1	0	0	0	0	0	1	Signalised	1	0	0	0	0	0	1	No change. Need to track an ART vehicle turning left from the nearside lane.	tbc
1	**Market Street** - Union Street	NB	Inbound	Signalised	1	0	0	0	1	0	0	Signalised	1	0	0	0	1	0	0	No change	
2	**Market Street** - Guild Street	SB	Outbound	Signalised	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	No change	tbc
2	Market Street - **Guild Street**	EB	Inbound	Signalised	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	No change	
3	**Guild Street** - Carmelite Street	WB	Outbound	Signalised	1	0	2	0	0	0	0	Signalised	1	0	2	0	0	0	0	No change	tbc
3	Guild Street - **Carmelite Street**	EB	Inbound	Signalised	2	0	0	1	1	0	0	Signalised	2	0	0	1	1	0	0	No change	
4	**Guild Street** - College Street	WB	Outbound	Signalised	1	0	2	0	0	0	0	Signalised	1	0	2	0	0	0	0	No change	tbc
4	Guild Street - College Street	EB	n/a	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Not used for Inbound direction	
5	**College Street** - Bridge Street - Wapping Street	NB	Outbound	Signalised	0	0	1	0	2	0	0	Signalised	0	0	1	0	2	0	0	No change	tbc
5	College Street - **Bridge Street** - Wapping Street	SB	Inbound	Signalised	2	0	0	0	0	0	0	Signalised	2	0	0	0	0	0	0	No change	
6	Denburn Road - Wapping Street	WB	n/a	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Not used for outbound direction. No change	tbc
6	Denburn Road - **Wapping Street**	EB	Inbound	Signalised	1	1	1	0	0	0	0	Signalised	1	1	1	0	0	0	1	No change	
7	**Bridge Street** - Union Street - Union Terrace	NB	Outbound	Signalised	0	1	0	0	0	0	1	Signalised	0	1	0	0	0	0	1	No change but lane widths will need to widened to accommodate ART and local bus services.	tbc
7	Bridge Street - Union Street - **Union Terrace**	SB	Inbound	Signalised	0	1	0	0	1	0	0	Signalised	0	1	0	0	1	0	0	No change	
8	**Union Terrace** - Rosemount Viaduct	NB	Outbound	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change	tbc
8	Union Terrace - **Rosemount Viaduct**	WB	Inbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change	
9	Blackfriars Street - Schoolhill - Rosemount Viaduct	EB	Outbound	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Not used for the outbound direction	tbc
9	**Blackfriars Street** - Schoolhill - Rosemount Viaduct	SB	Inbound	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change	
10	**Rosemount Viaduct** - Skene Street	NB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	0	1	0	0	1	0	0	Right turn into Skene Street currently banned so this will need to be removed to accommodate outbound ART services	tbc
10	Rosemount Viaduct - Skene Street	WB	Inbound	Signalised	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Signalised	n/s	n/s	n/s	n/s	n/s	n/s	n/s	Not used in the inbound direction	
11	Denburn Road - **Woolmanhill** - Gilcomston Steps	NB	Outbound	Roundabout	1	0	0	0	1	0	0	Roundabout	1	0	0	0	1	0	0	No change	Note 1
11	Denburn Road - Woolmanhill - **Gilcomston Steps**	SB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. SB Bus lane set back from junction	
12	**Skene Square** - Maberly Street - Rosemount Place	NB	Outbound	Roundabout	0	1	0	0	1	0	0	Signalised	0	1	1	0	0	0	0	BCIP scheme. Right turn removed	Note 1
12	**Skene Square** - Maberly Street - Rosemount Place	SB	Inbound	Roundabout	0	1	0	1	0	0	0	Signalised	0	1	1	0	0	0	0	BCIP scheme with SB bus lane set back from junction	
13	**Caroline Place** - Hutcheon Street - Westburn Road	NB	Outbound	Signalised	0	0	1	0	1	0	0	Signalised	0	1	0	0	1	0	0	Modified BCIP scheme. Buses only on Rosemount Terrace	Note 1
13	Caroline Place - Hutcheon Street - **Westburn Road**	SB	Inbound	Signalised	0	0	0	0	0	1	0	Signalised	tbc	tbc	tbc	tbc	tbc	tbc	tbc	Modified BCIP scheme. Buses only on Rosemount Terrace	
14	**Westburn Road** - Cornhill Road - Watson Street	WB	Outbound	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	1	0	0	0	Watson Street closed to motor traffic/ no left turn	Note 2
14	**Westburn Road** - Cornhill Road - Watson Street	EB	Inbound	Signalised	0	1	0	0	1	0	0	Signalised	0	1	1	0	0	0	0	Watson Street closed to motor traffic/ no right turn	
14	**Westburn Road** - Argyll Crescent - Argyll Place	WB	Outbound	Signalised	0	1	0	0	1	0	0	Signalised	0	1	0	0	1	0	0	No proposed change	Note 2
15	**Westburn Road** - Argyll Crescent - Argyll Place	EB	Inbound	Signalised	0	1	0	0	0	0	0	Signalised	0	1	0	0	0	0	0	No proposed change. Assumes no proposed bus re-routing	
16	**Westburn Road** - Foresthill Road - Raeden Park Road	WB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	1	0	1	0	1	0	0	Bus lane to stop line with 'hold the left'	Note 2
16	**Westburn Road** - Foresthill Road - Raeden Park Road	EB	Inbound	Signalised	1	0	1	0	1	0	0	Signalised	1	0	1	0	1	0	0	Bus lane to stop line with 'hold the left'	
17	**Westburn Road** - North Anderson Drive - Lang Stracht	WB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	1	0	2	0	1	0	1	Bus lane to stop line with 'hold the left'	Note 2
17	**Westburn Road** - North Anderson Drive - Lang Stracht	EB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	1	0	2	0	1	0	1	Bus lane to stop line with 'hold the left'	
18	**Lang Stracht** - Mastrick Drive - Summerhill Road	WB	Outbound	Signalised	0	1	1	0	1	0	0	Signalised	1	0	1	0	1	0	1	Bus lane to stop line with 'hold the left'	Note 2
18	**Lang Stracht** - Mastrick Drive - Summerhill Road	EB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	1	0	1	0	1	0	1	Bus lane to stop line with 'hold the left'	
19	**Lang Stracht** - Stronsay Drive	WB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. Bus lane set back from junction	Note 2
19	**Lang Stracht** - Stronsay Drive	EB	Inbound	Signalised	0	0	1	1	0	0	0	Signalised	0	0	1	0	1	0	1	EB bus lane to stop line with additional lane required for right tur	
20	**Lang Stracht** - Fernhill Drive	WB	Outbound	Signalised	0	0	1	1	0	0	0	Signalised	0	0	1	0	0	0	1	WB bus lane to stop line with banned right turn 160224 - Allow right turn for buses only (see email from Elaine 140224)	Note 2
20	**Lang Stracht** - Fernhill Drive	EB	Inbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	No change. EB bus lane set back from junction	
21	**Lang Stracht** - Springhill Road	WB	Outbound	Signalised	0	0	2	0	1	0	0	Signalised	0	0	2	0	1	0	0	No change. WB bus lane set back from junction. Longer right turn flare	Note 2
21	**Lang Stracht** - Springhill Road	EB	Inbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. EB bus lane set back from junction. Split ahead and left turn, new MOC	
22	**Lang Stracht** - Rousay Drive	WB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	Bus lane becomes left turn except buses/ bus lane on exit	Note 2
22	**Lang Stracht** - Rousay Drive	EB	Inbound	Signalised	0	0	1	1	0	0	0	Signalised	0	0	1	0	1	0	1	Bus lane to stop line	
23	**Lang Stracht** - Skye Road	WB	Outbound	Signalised	0	0	1	0	1	0	0	Signalised	1	0	0	0	1	0	1	Bus lane to stop line requiring additional lane for right turn	Note 2
23	**Lang Stracht** - Skye Road	EB	Inbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	1	Bus lane to stop line with 'hold the left'	
24	**Lang Stracht** - Maidencraig Drive	WB	Outbound	Signalised	1	0	0	1	0	0	0	Signalised	1	0	0	1	0	0	0	No change. Bus lane becomes left turn except buses/ bus lane on exit	Note 2
24	**Lang Stracht** - Maidencraig Drive	EB	Inbound	Signalised	1	0	0	1	0	0	0	Signalised	1	0	1	0	1	0	1	Bus lane to stop line with 'hold the left'	
25	**Lang Stracht** - Old Lang Stracht	WB	Outbound	Signalised	0	0	0	0	1	0	0	Signalised	0	0	0	0	1	0	0	No change	Note 2
25	**Lang Stracht** - Old Lang Stracht	EB	Inbound	Signalised	1	0	0	0	0	0	0	Signalised	1	0	0	0	0	0	0	No change	
26	Skene Road - **Lang Stracht** - A944 (Jessiefield Roundabout)	WB	Outbound	Roundabout	1	0	0	0	1	0	0	Roundabout	1	0	0	0	1	0	0	No change	Note 2
26	Skene Road - Lang Stracht - **A944** (Jessiefield Roundabout)	EB	Inbound	Roundabout	1	0	0	1	0	0	0	Roundabout	1	0	0	1	0	0	0	No change. EB bus lane set back from junction	
27	**A944** - Fairley Road	WB	Outbound	Roundabout	0	1	1	1	0	0	0	Roundabout	0	1	1	1	0	0	0	No change. WB bus lane set back from junction with bus advance area	Note 3
27	**A944** - Fairley Road	WB	Inbound	Roundabout	0	1	1	1	0	0	0	Roundabout	0	1	1	1	0	0	0	No change. EB bus lane set back from junction	
28	**A944** - Kingswells Causeway	WB	Outbound	Signalised	0	0	2	0	2	0	0	Signalised	0	0	2	0	2	0	0	No change	Note 3
28	**A944** - Kingswells Causeway	EB	Inbound	Signalised	1	0	2	0	0	0	0	Signalised	1	0	2	0	0	0	0	No change. EB bus lane set back from junction	
29	**A944** - AWPR (A90)	WB	Outbound	Signalised	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	No change. WB bus lane set back from junction	Note 3
29	**A944** - AWPR (A90)	EB	Inbound	Signalised	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	No change. EB bus lane set back from junction	
30	**A944** - B9119	WB	Outbound	Signalised	1	0	1	1	0	0	0	Signalised	1	0	1	1	0	0	0	No change	Note 3
30	**A944** - B9120	EB	Inbound	Signalised	0	0	0	1	0	0	0	Signalised	0	0	0	1	0	0	0	No change	
31	**A944** - Westhill Drive - Straik Road	WB	Outbound	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change	Note 3
31	A944 - Westhill Drive **- Straik Road**	EB	Inbound	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change	
32	**Straik Road** - Enterprise Drive	WB	Outbound	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No change. End of ART route	
32	**Straik Road** - Enterprise Drive	EB	Inbound	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Priority	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No change. End of ART route	

Notes

1 Concept designs can be found in 'Stantec - A944 Detailed Appraisal Concept Design (Appendix C - Corridor II - Variants)'
2 Concept designs can be found in 'Stantec - A944 Detailed Appraisal Concept Design (Appendix A - Corridor II)'
3 Concept designs can be found in 'Stantec - A944 Detailed Appraisal Concept Design (Appendix A - Corridor I)'
1-3 These designs show only concept layouts for links produced as part of the A944/ A9119 STAG Detailed Appraisal. Junction layouts to be confirmed at the next Design (Outline) stage.

A96

Junction Number	Location	Direction		EXISTING Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	PROPOSED Junction Type	Left only	Left + Ahead	Ahead	Ahead + Right	Right Only	All	Bus Lane	Comments	Drawing Number (1)
1	**Union Street** - Broad Street	EB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. Check City Centre masterplan	tbc
1	Union Street - **Broad Street**	SB	Inbound	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change. Check City Centre masterplan	
2	**Broad Street** - Upper Kirkgate - Gallowgate	NB	Outbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change. Bus gate to south of junction retained	tbc
2	Broad Street - Upper Kirkgate - **Gallowgate**	SB	Inbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change. Bus gate to south of junction retained	
3	**Gallowgate** - Berry Street	NB	Outbound	Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change	tbc
3	**Gallowgate** - Berry Street	SB	Inbound	Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change	
4	**Gallowgate** - Causewayend (Mounthooly r/a)	NB	Outbound	Roundabout	1	0	0	1	0	0	0	Roundabout	1	0	0	1	0	0	0	No change. Exit to r/a bus and local access only	tbc
4	Gallowgate - **Causewayend** (Mounthooly r/a)	SB	Inbound	Roundabout	0	1	0	0	1	0	0	Roundabout	0	1	0	0	1	0	0	No change. SB bus lane set back from junction	332610452-STN-HGN-XX-DR-H-5522-BCEF
5	**Causewayend** - Fraser Place - Powis Place	NB	Outbound	Signalised	0	0	2	0	1	0	0	Signalised	1	0	0	1	0	0	0	NB bus lane set back from junction	332610452-STN-HGN-
5	Causewayend - Fraser Place - **Powis Place**	SB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	1	0	0	1	0	0	0	SB bus lane set back from junction	XX-DR-H-5521-B
6	**Powis Place** - George Street - Powis Terrace	NB	Outbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	0	0	0	0	1	NB traffic gate giving buses priority along Powis Terrace	332610452-STN-HGN-
6	Powis Place - George Street - **Powis Terrace**	SB	Inbound	Signalised	1	0	0	1	0	0	0	Signalised	0	0	0	0	0	1	0	SB reduced to a single lane to accommodate cycle track	XX-DR-H-5521-B
7	**Powis Terrace** - Bedford Road	NB	Outbound	Signalised	0	0	1	1	0	0	0	Signalised	0	0	0	1	0	0	0	NB reduced to single lane to accommodate cycle track	332610452-STN-HGN-
7	**Powis Terrace** - Bedford Road	SB	Inbound	Signalised	0	1.5	0	0	0	0	0	Signalised	0	1	0	0	0	0	0	SB reduced to single lane to accommodate cycle track	XX-DR-H-5520-B1
8	**Powis Terrace** - Belmont Road	NB	Outbound	Signalised	0	0	0	0	0	1.5	0	Signalised	0	0	0	1	0	0	0	NB left turn banned to accommodate cycle track	332610452-STN-HGN-
8	**Powis Terrace** - Belmont Road	SB	Inbound	Signalised	0	0	0	0	0	1.5	0	Signalised	1	0	1	0	0	0	0	SB right turn banned to accommodate cycle track	XX-DR-H-5520-B1
9	**Powis Terrace** - Berryden Road - Great Northern Road	NB	Outbound	No junction	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Signalised	0	0	1	0	1	0	0	BCIP junction modification	332610452-STN-HGN-
9	Powis Terrace - **Berryden Road** - Great Northern Road	SB	Inbound	No junction	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Signalised	1	0	2	0	0	0	0	BCIP junction modification	XX-DR-H-5519-B
10	Great Northern Road - **Berryden Road** (Kittybrewster r/a)	NB	Outbound	Roundabout	0	0	0	0	0	1	0	Roundabout	0	1	0	1	0	0	0	BCIP junction with new Berryden Road arms	332610452-STN-HGN-
10	**Great Northern Road** - Berryden Road (Kittybrewster r/a)	SB	Inbound	Roundabout	1	0	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	BCIP junction with new Berryden Road arms	XX-DR-H-5517-B
11	**Great Northern Road** - Don Street	NB	Outbound	Signalised	0	0	2	0	1	0	0	Signalised	0	0	1	0	1	0	1	NB bus lane up to stop line	332610452-STN-HGN-
11	**Great Northern Road** - Don Street	SB	Inbound	Signalised	0	1	1	0	0	0	0	Signalised	1	0	1	0	0	0	1	SB bus lane up to stop line	XX-DR-H-5515/ 15B
12	**Great Northern Road** - Mugiemoss (Haudagain r/a)	WB	Outbound	Roundabout	0	1	1	0	1	0	0	Signalised	0	1	0	1	0	0	0	WB bus lane set back from junction	332610452-STN-HGN-
12	**Great Northern Road** - Mugiemoss (Haudagain r/a)	EB	Inbound	Roundabout	0	1	0	1	1	0	0	Signalised	1	0	1	0	0	0	1	EB bus lane to stop line with 'hold the left'	XX-DR-H-5512-OP1
13	**Great Northern Road** - Auchmill Road (Haudagain b/p)	WB	Outbound	Signalised	0	1	1	0	0	0	0	Signalised	0	1	1	0	0	0	0	No change	332610452-STN-HGN-
13	**Great Northern Road** - Auchmill Road (Haudagain b/p)	EB	Inbound	Signalised	0	0	0	1	1	0	1	Signalised	0	0	0	1	1	0	1	No change. Road widening required to maintain existing	XX-DR-H-5512-OP2
14	**Auchmill Road** - Auchmill Terrace	WB	Outbound	Signalised	0	0	2	0	0	0	1	Signalised	0	1	1	0	0	0	0	Bus Lane set back from junction	332610452-STN-HGN-
14	**Auchmill Road** - Auchmill Terrace	EB	Inbound	Signalised	0	0	2	0	0	0	0	Signalised	0	0	1	1	0	0	1	Bus Lane bypass to junction	XX-DR-H-5511
15	**A96** - A947 (Bucksburn r/a)	WB	Outbound	Roundabout	1	1	0	0	1	0	0	Roundabout	1	0	1	0	0	0	1	Bypass lane converted to bus lane (alt use Inverurie Road)	332610452-STN-HGN-
15	**A96** - A947 (Bucksburn r/a)	EB	Inbound	Roundabout	1	0	0	0	2	0	0	Roundabout	0	1	1	0	0	0	0	Bus Advance Area	XX-DR-H-5508
16	**A96** - Bankhead Avenue (Bankhead r/a)	WB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	Roundabout retained	332610452-STN-HGN-
16	**A96** - Bankhead Avenue (Bankhead r/a)	EB	Inbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	Roundabout retained	XX-DR-H-5506
17	**A96** - Gough Burn Crescent	WB	Outbound	Signalised	0	0	2	0	0	0	1	Signalised	0	0	1	0	1	0	1	Potential bus only right turn. Right turn out of GBC provided	332610452-STN-HGN-
17	**A96** - Gough Burn Crescent	EB	Inbound	Signalised	1	0	2	0	0	0	0	Signalised	0	0	2	0	0	0	1	Banned left turn - drivers use Dyce Drive to access TECA	XX-DR-H-5505
18	**A96** - Dyce Drive	WB	Outbound	Signalised	0	1	0	1	1	0	0	Signalised	0	1	1	0	1	0	0	Bus Lane set back from junction	332610452-STN-HGN-
18	**A96** - Dyce Drive	EB	Inbound	Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	Bus Lane set-back from junction	XX-DR-H-5503
19	**A96** - Airport Road (Craibstone r/a)	WB	Outbound	Roundabout	1	1	0	1	0	0	0	Roundabout	1	1	0	1	0	0	0	No change	332610452-STN-HGN-
19	**A96** - Airport Road (Craibstone r/a)	EB	Inbound	Roundabout	1	1	0	1	0	0	0	Roundabout	1	1	0	1	0	0	0	No change	XX-DR-H-5501
20	**Airport Road** - P&R - Walton Road	NB	Outbound	Signalised	1	0	2	0	1	0	0	Signalised	1	0	2	0	1	0	0	No change. No bus lanes	tbc
20	**Airport Road** - P&R - Walton Road	SB	Inbound	Signalised	0	1	2	0	1	0	0	Signalised	0	1	2	0	1	0	0	No change. No bus lanes	
21	**Airport Road** - Harvest Avenue	NB	Outbound	Signalised	1	0	3	0	2	0	0	Signalised	1	0	3	0	2	0	0	No change. No bus lanes	tbc
21	**Airport Road** - Harvest Avenue	SB	Inbound	Signalised	0	1	2	0	1	0	0	Signalised	0	1	2	0	1	0	0	No change. No bus lanes	
22	**Airport Road** - Dyce Drive - Argyll Road	NB	Outbound	Signalised	1	0	1	0	1	0	0	Signalised	1	0	1	0	1	0	0	No change. No bus lanes	tbc
22	Airport Road - Dyce Drive - **Argyll Road**	SB	Inbound	Signalised	0	1	0	1	0	0	0	Signalised	0	1	0	1	0	0	0	No change. No bus lanes	
23	**Argyll Road** - Brent Road (one-way)	NB	Outbound	Roundabout	0	1	0	1	0	0	0	Roundabout	0	1	0	1	0	0	0	No change. No bus lanes	tbc
23	Argyll Road - **Brent Road** (one-way)	SB	Inbound	Roundabout	1	0	0	0	0	1	0	Roundabout	1	0	0	0	0	1	0	No change. No bus lanes	
24	**Dyce Drive** - International Avenue	EB		Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. No bus lanes	tbc
24	**Dyce Drive** - International Avenue	WB		Signalised	0	1	1	0	1	0	0	Signalised	0	1	1	0	1	0	0	No change. No bus lanes	
25	**Dyce Drive** - Wellheads Drive	SB		Signalised	1	0	1	0	0	0	0	Signalised	1	0	1	0	0	0	0	No change. No bus lanes	tbc
25	Dyce Drive - **Wellheads Drive**	WB		Signalised	0	0	0	0	0	0	0	Signalised	0	0	0	0	0	0	0	No change. No bus lanes	
26	**Wellheads Drive** - International Avenue	WB		Signalised	0	1	0	0	1	0	0	Signalised	0	1	0	0	1	0	0	No change. No bus lanes	tbc
26	**Wellheads Drive** - International Avenue	EB		Signalised	0	1	0	0	1	0	0	Signalised	0	1	0	0	1	0	0	No change. No bus lanes	
27	**Wellheads Drive** - Forrit Burn Road	EB		Signalised	0	0	1	0	0	0	1	Signalised	0	0	1	0	0	0	1	No change. No bus lanes	tbc
27	Wellheads Drive - **Forrit Burn Road**	NB		Signalised	0	0	0	0	0	1	0	Signalised	0	0	0	0	0	1	0	No change. No bus lanes	
28	Gough Burn Crescenrt - TECA access	SB		Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change. No bus lanes	tbc
28	Gough Burn Crescenrt - TECA access	NB		Roundabout	0	0	0	0	0	1	0	Roundabout	0	0	0	0	0	1	0	No change. No bus lanes	

Notes

1 Outline designs can be found in 'Stantec - A96 Detailed Appraisal Outline Design (With Variant B)'

TECHNICAL NOTE

Job No: 330610570

Date: 25th March 2024

Subject: **Supporting Technical Note B - ART Routeing Analysis – Bus Network Changes**

Introduction

Overview

This Note describes the changes proposed to the local bus network in Aberdeen to support the modelling of the Aberdeen Rapid Transit (ART) route tests, as set out in the main Routeing Analysis Report, *Aberdeen Rapid Transit - Routeing Analysis - Report (Stantec, March 2024).* This Note and should be read in conjunction with that report.

Note that the changes discussed within this note were based on services operating at the time the ASAM19 routeing analysis modelling was undertaken, as well as through consideration of the bus network as represented in the ASAM19 base model (2019 base year). As such, services noted within this note may have changed / been withdrawn since this work was undertaken.

Background

Initial modelling of ART, undertaken in ASAM19, was undertaken to inform the Detailed Options Appraisal stage of the study. At this stage, all the ART options which were being considered were modelled on the same ART network. This enabled comparison between the options and provided an indication of how the options performed all other things being equal. That was not to say however, that the network chosen for the modelling in ASAM at that time was the preferred network, just that it was considered at that stage to be the most appropriate network on which to undertake the ASAM testing. The network used in that testing was aligned to the ART vision along the following four corridors:

- **North** A956 (N): Bridge of Don P&R to city centre via Ellon Road
- **North - West** A96: Craibstone P&R to city centre via A96 (Auchmill Road, Great Northern Road, Powis Terrace, Powis Place, Causewayend) and Gallowgate
- **West** A944: Westhill to city centre via the A944 (Straik Road, Lang Stracht and Westburn Road) and then Skene Square / Denburn Road via the Berryden Corridor Improvement Project (BCIP)
- **South** A92 (S): Portlethen to city centre via A92, Great Southern Road (B9077) and Holborn Street (A9013)

Before ART was tested, changes to the local bus network were made to avoid a duplication of services where local bus routes overlapped with proposed ART services. When a significant overlap occurred, the local bus route was generally removed. When the overlap was less significant, modifications were made, such as removing part of the route or extending it into an area where a route that had been removed left a gap in the underlining bus network. The changes made to the local bus network to support this initial testing was set out in a Supporting Note to the Detailed Options Appraisal Report, *ART Detailed Options Appraisal - Supporting Technical Note C - Integration of Existing Bus Network_v2 (Stantec, March 2023).*

Routeing Testing

As part of this Routeing Analysis work, ten ART route tests have been developed and refined in consultation with the Council, bus operators and Nestrans and have been tested within ASAM19. Most tests are based on a Core network of two cross-city routes with subsequent tests making small but significant changes from the Core Test to either change the routeing in the corridor, or the terminus point. The last two tests are standalone tests investigating an alternative cross-city service alignment or additional new destinations with three ART cross-city services and Robert Gordon University and the proposed Beach Development included within the network.

Error! Reference source not found. describes the route tests and summarises the difference between the s cenarios compared to the Core. The route scenarios are shown graphically in figures that can be found at the end of each of the analysis sections below.

As with the initial testing, the local bus network needed to be modified to ensure ART routes integrated rather than duplicated existing bus routes which would have led to inefficient bus operations and a less commercially viable overall Aberdeen bus network. The remainder of this note describes the process involved in changing the local bus network to respond to each of the ART route tests.

Table 1: ART Routeing Tests

Test	ART Service Routes	Routeing	Purpose of Test
Core	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	N/A
A1	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Changed routeing at airport. Outbound: TECA → airport → Craibstone P&R Inbound: Craibstone P&R → city centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Changed routeing at airport. Gauge comparative benefits of routeing inbound directly from Craibstone P&R site
A2	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Changed routeing at airport. Clockwise (every other service): city centre → TECA → airport → Craibstone P&R → city centre Anti-clockwise (every other service): city centre → Craibstone P&R → TECA → city centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Changed routeing at airport. Gauge comparative benefits of routeing both clockwise and anti-clockwise at Craibstone P&R / airport. Routeing would provide direct (and attractive) inbound routeing from P&R to city centre, as well as direct (and attractive) inbound routeing from Airport to city centre. Would enable trips from P&R to airport. Frequency of P&R to city centre *direct* service only every other ART service
B1	**North to West:** Cloverhill via Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing beyond Bridge of Don P&R to new housing development site (400 housing units assumed built out by 2030 and represented as such in ASAM19 2030 Do Min model)
B2	**North to West:** Blackdog and Cloverhill via Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound)	Gauge benefits of routeing beyond Bridge of Don P&R to the Blackdog development site (580 housing units

Test	ART Service Routes	Routeing	Purpose of Test
	and TECA) to Portlethen Mobility Hub	**South:** Market Street / Victoria Bridge / Wellington Road	built out by 2030 and represented as such in ASAM19 2030 Do Min model)
C1	**North to West:** Bridge of Don P&R to Westhill **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of extending western corridor to Westhill rather than Kingswells P&R
C2	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A9119 (Queen's Road / Skene Road) / A944 **South:** Market Street / Victoria Bridge / Wellington Road	Gauge benefits of routeing via A9119 instead of via A944 between city centre and A9119/A944 junction
D	**North to West:** Bridge of Don P&R to Kingswells P&R **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Holburn Street / Great Southern Road / West Tullos Road / Wellington Road	Gauge benefits of routeing south via Holburn Street / Great Southern Road / West Tullos Road / Wellington Road
E	**North-West to West:** Craibstone P&R (via airport and TECA) to Kingswells P&R **North to South:** Bridge of Don P&R to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **South:** Market Street / Victoria Bridge / Wellington Road	To gauge benefits of alternative combination of cross city services to compare to Core Test, i.e., NW-W and N-S Note: North to South provides direct routeing but North-West to West connection is far longer than straight line routeing (see mapping)
F	**North to South (RGU):** Bridge of Don P&R to Robert Gordon University **West to East (Beach):** Kingswell P&R to beach via Union Street **North-West to South:** Craibstone P&R (via airport and TECA) to Portlethen Mobility Hub	**North:** Ellon Road / King Street **North-West:** Craibstone -> airport -> TECA routeing (both inbound and outbound) with Powis Place / Gallowgate route into centre **West:** A944 (via Blackfriars St (inbound) and Rosemount Viaduct /Skene St (outbound) **East:** Justice Street / Beach Boulevard **South (Portlethen Mobility Hub):** Market Street / Victoria Bridge / Wellington Road **South (RGU):** Holburn Street / Garthdee Road	To gauge benefits of alternative combination of cross city services to provide connectivity to RGU and Beach masterplan area as part of ART network

As with the initial testing, the local bus network needed to be modified to ensure ART routes integrated rather than duplicated existing bus routes which would have led to inefficient bus operations and a less commercially viable overall Aberdeen bus network. The remainder of this note describes the process involved in changing the local bus network to respond to each of the ART route tests.

Methodology

Study Area

The assessment area (Figure 1: Assessment areaFigure 1) covers the urban extents of Aberdeen City and outlying residential and employment areas. This includes, to the:

- North: Bridge of Don and proposed new residential settlements at Cloverhill and Blackdog
- North-west: Dyce, Kirkhill Industrial Estate and the Airport
- West: Kingswells, Prime Four, Westhill and Skene
- South-west: Robert Gordon University, Cults, Bieldside, Milltimber and Peterculter
- South: Kincorth, Altens, Cove Bay and Portlethen

Existing Bus Network

The bus network in Aberdeen consists of city and long distance routes. City routes are located within the urban extents of Aberdeen City and are mainly operated by First. Long distance routes serve wider residential settlements and employment zones beyond the proposed ART network and are operated predominantly by Stagecoach. These city and long distance routes are listed in Appendix A along with the key destinations they serve.

With long distance routes extending beyond the proposed ART network, it was decided to retain all these routes within the ART route tests and only make changes to the city routes where overlap with the ART was likely to be more substantial and impact the viability of the local bus network.

Route Assessment

The approach used to propose changes to the existing bus network is as follows:

1. The existing bus network was reviewed to identify those city routes that overlap or closely parallel the routes proposed in each ART route scenario
   a. Depending on the extent of the overlap or parallel running, a decision was made to either retain, remove or shorten the route
2. Any negative impact from a removed or modified route, such as leaving areas with no bus service was identified and mitigated by proposing other routes be extended or service frequency increased to reconnect areas to the local bus network. These are referred to as indirect impacts.

The outcome of this process was to categorise each city route into one of the following:

   a. Retain route
   b. Remove route
   c. Modified route (i.e. cut-back, extend or increase service frequency)

The assessment started with the Core scenario with each city bus route assigned one of the above categories depending on the level of route overlap, parallel running or mitigation (route extensions, service frequency increases). With other scenarios being a variation on the Core scenario the Core proposals were copied across the other scenarios and for each route, the following colour coding applied.

- GREY indicates the bus route is unchanged from the Core Scenario
- BLACK indicates the ‘Comment’ for the bus route has been updated but the ‘Status’ (Retain, Remove or Modify) is unchanged, and
- BLUE indicates the ‘Status’ and ‘Comment’ for the bus route has changed

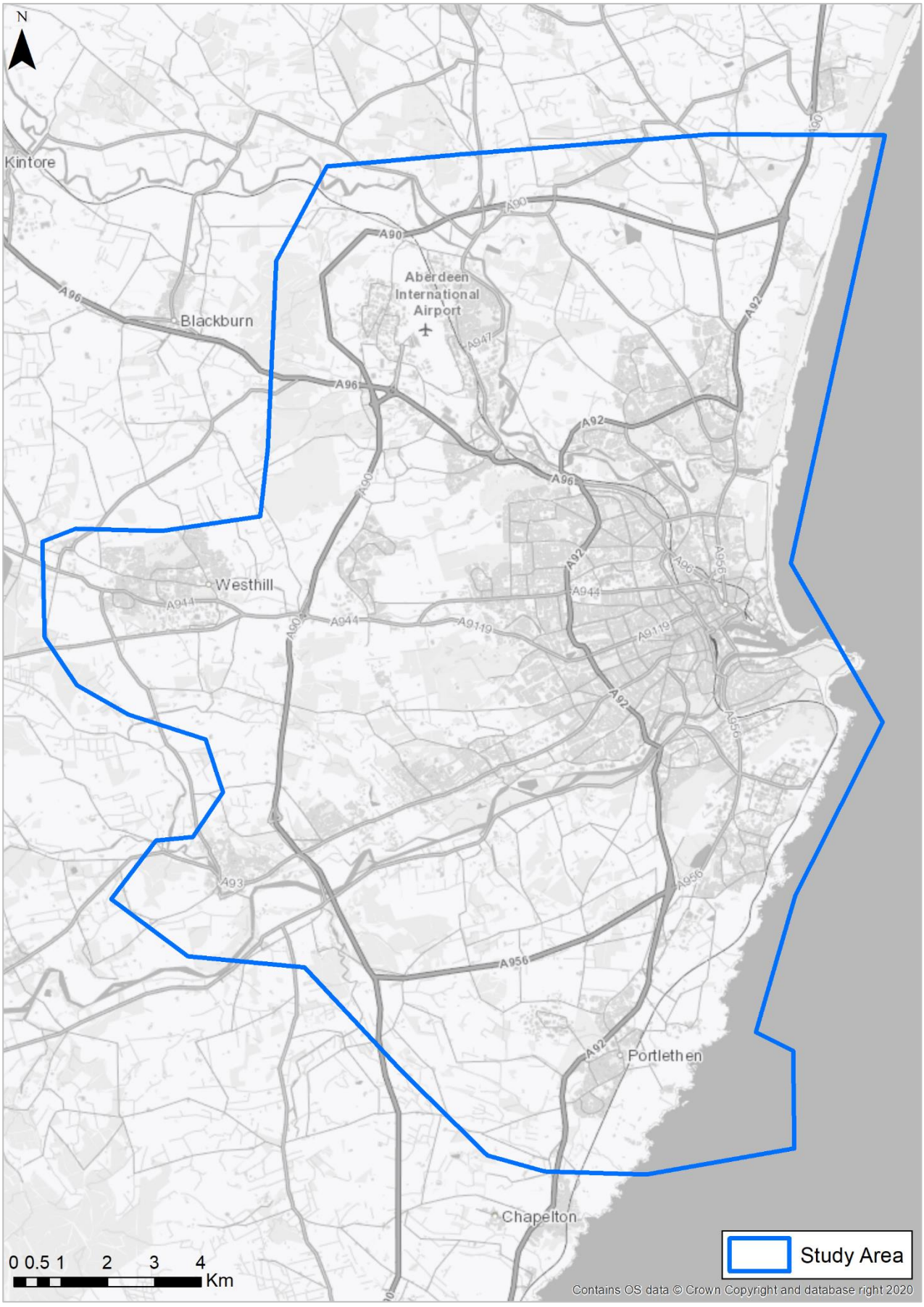


Figure 1: Assessment area

Analysis and Results

Overview

The following tables summarise the proposed changes to city routes for each ART route test. For the main destinations served by each bus route see Appendix A. As these are summary tables, only 'Removed' and 'Modified' routes are shown with 'Retained' routes excluded.

Core Route Scenario

Route 1: Craibstone P&R (via A96, Gough Burn Crescent) to Portlethen Mobility Hub (via Victoria Rd, Wellington Rd)
Route 2: Kingswells P&R (via A944 Westburn Road, Lang Stracht) to Bridge of Don P&R (via King Street)

Changes to city bus routes deemed necessary to support the Core route scenario are summarised in Table 2.

Table 2: Summary of changes to city routes to support the Core route scenario

Service	Change	Comment
1	Modify	Overlap with ART on King Street. Modify route with alternate buses serving Danestone and Middleton Park with new connection to Middleton Park supporting removal of Route 2 (see below)
2	Remove	Overlap with ART on King Street. Lost connection to Middleton Park provided by modified Route 1 (see above)
3, 3A, 3B	Modify	Extend route to Sheddocksley to support removal of Route 59 (see below)
4	Modify	Extend route to improve connections to Kingswells and support removal of Route 14 (see below). Alternative services to Countesswells and Kingswells
8	Remove	Route 1 (modified), Route 1B and Route 8A provide more direct connections between ARI, Danestone, Middleton Park and Shielhill/ Dubford while Route 7/7A/7B maintain connections to Stonehaven and Newtonhill
8A	Modify	Enhance service frequency to support removal of Route 8 (see above)
14	Remove	Overlap with ART on Westburn Road and Lang Stracht. Routes 4 and 3/3A/3B provide alternative services
20	Remove	Overlap with ART on Market Street/ Wellington Road and parallel running on King Street. Lost connections to Torry/ Balnagask replaced by Routes 12 & 15
23	Modify	Overlap with ART on A944 and parallel running on A96. Remove western section (Sheddocksley), retain northern section (Hilton) and extend to Torry
59	Remove	Overlap with ART on Westburn Road. Lost connections to Northfield provided by Routes 3 and 12 and Torry by Route 12 and 23
172	Remove	Overlap with ART on the A96 (Bucksburn to George Street). Lost connects to Bucksburn provided by Route 17/17A and Stoneywood/ Dyce/ Ferryhill/ Kincorth by Route 18
727	Remove	Overlap with ART along the full length of A96 while also serving the Airport and Craibstone P&R. Lost connections provided by ART
X27	Remove	Overlap with ART along the A96 (Airport to Haudagain). Lost connections to Kirkhall Industrial Estate and Dyce provided by new Route A (see below)
New Route A (Note 1)	New	Provides a connection between Westhill (Arnhall Business Park), the Kirkhall Industrial Estate and Dyce Railway Station via Kingswells and Bucksburn. Interchange with Route 17 services at Bankhead for direct connections to Wellheads Industrial Estate and with ART services at TECA for the Airport

Notes

1. A new bus route is proposed that connects Westhill to Dyce railway station via Kingswells, Sclattie Park and the Kirkhill Industrial Estate using the roads set out below. The route will use all existing bus stops on these roads plus some proposed new bus stops. Start/ End: Old Skene Road j/w Broadshade Road - Old Skene Road (Broadshade Road to Hay's Way) - Hay's Way (Old Skene Road to Westhill Drive) - Westhill Drive (Hay's Way to Straik Road) - A944 (Westhill Drive to Kingswells Causeway) - Kingswells Causeway to Kingswells P&R to Kingswells Drive - Kingswells Drive and Kingswells Crescent - Fairley Road (Kingswells Crescent to Kepplehills Drive) - Kepplehills Drive to Kepplehills Road to Sclattie Park - Sclattie Park (Kepplehills Drive to Bankhead roundabout) - A96 (Bankhead roundabout to Gough Burn Crescent) - Gough Burn Crescent via TECA (A96 to Forrit Burn Road - Forrit Burn Road (Gough Burn Crescent to Wellheads Drive) - Wellheads Drive (Forrit Burn Road to Dyce Drive) - Dyce Drive to Kirkhill Industrial Estate loop - Pitmedden Road to Victoria Street to Dyce Railway Station (Terminate)
It is suggested the route operates 4 buses per direction per hour 7-10am and 4-7pm, and 2 buses per direction per hour 10am-4pm (Monday to Friday). Saturday and Sunday services to be confirmed.

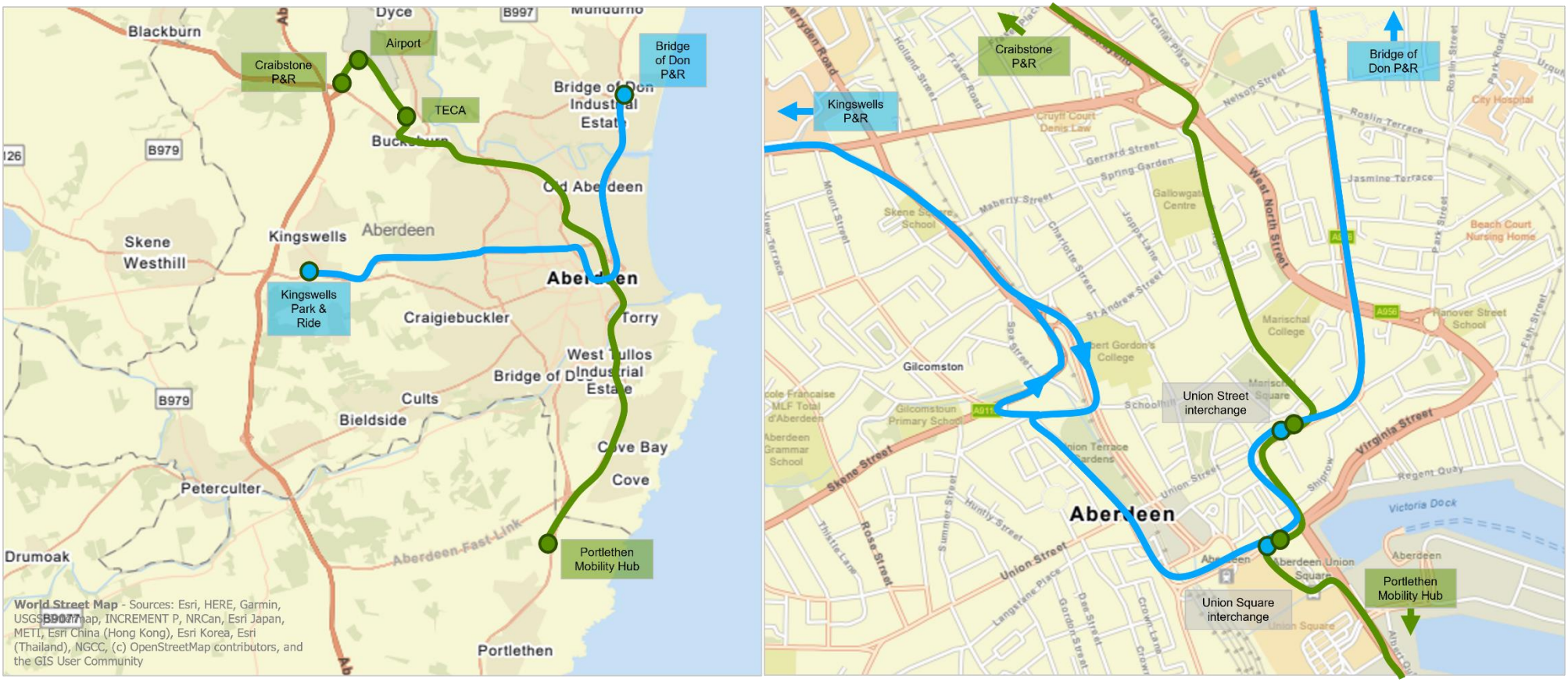


Figure 2: ART network in the Core Test

Tests A1 and A2

Route 1: Craibstone P&R (via A96 and Gough Burn Crescent using a loop to serve the P&R site) to Portlethen Mobility Hub (via Victoria Road, Wellington Road)
Route 2 (Core): Kingswells P&R (via Westburn Road, Lang Stracht) to Bridge of Don P&R (via King Street)

For Test A1, the change from the Core scenario is that ART loops ani-clockwise via TECA, the Airport and P&R site i.e.

- Outbound services route: TECA - Airport - Craibstone P&R (drop off and terminate)
- Inbound services route: Craibstone P&R (pick up) to A96 (towards the city centre)

No trips are possible between the P&R and Airport and there is a loss of connection to TECA on services inbound.

The A2 route scenario addresses this loss of connection by alternating inbound and outbound services clockwise and anticlockwise at TECA, the airport and Craibstone P&R. Both scenarios potentially impact the following City routes (see Table 3) while other City routes remain as those in the Core scenario.

- Route 727 uses Gough Burn Crescent to serve TECA and the Airport
- Route X27 uses Gough Burn Crescent to serve TECA, the Airport and Kirkhall Industrial Estate

Table 3: Summary of changes to city routes to support Tests A1 and A2

Service	Change	Comment
1	Modify	Overlap with ART on King Street. Modify route with alternate buses serving Danestone and Middleton Park with new connection to Middleton Park supporting removal of Route 2 (see below)
2	Remove	Overlap with ART on King Street. Lost connection to Middleton Park provided by modified Route 1 (see above)
3, 3A, 3B	Modify	Extend route to Sheddocksley to support removal of Route 59 (see below)
4	Modify	Extend route to improve connections to Kingswells and support removal of Route 14 (see below). Alternative services to Countesswells and Kingswells
8	Remove	Route 1 (modified), Route 1B and Route 8A provide more direct connections between ARI, Danestone, Middleton Park and Shielhill/ Dubford while Route 7/7A/7B maintain connections to Stonehaven and Newtonhill
8A	Modify	Enhance service frequency to support removal of Route 8 (see above)
14	Remove	Overlap with ART on Westburn Road and Lang Stracht. Routes 4 and 3/3A/3B provide alternative services
20	Remove	Overlap with ART on Market Street and Wellington Rd and parallel running on King St. Lost connections to Torry and Balnagask replaced by Routes 12 & 15
23	Modify	Overlap with ART on A944 and parallel running on A96. Remove western section (Sheddocksley), retain northern section (Hilton) and extend to Torry
59	Remove	Overlap with ART on Westburn Road. Lost connections to Northfield provided by Routes 3 and 12 and Torry by Route 12 and 23
172	Remove	Overlap with ART on the A96 (Bucksburn to George Street). Lost connects to Bucksburn provided by Route 17/17A and Stoneywood/ Dyce/ Ferryhill/ Kincorth by Route 18
727	Remove	Overlap with ART along the full length of A96 while also serving the Airport and Craibstone P&R. Lost connections provided by ART. Not impacted by the above TECA - Airport - P&R routing
X27	Remove	Overlap with ART along the A96 (Airport to Haudagain). Lost connections to Kirkhall Industrial Estate and Dyce provided by new Route A (see below). Not impacted by the above TECA - Airport - P&R routing
New Route A (Note 1- Table 2)	New	Provides a connection between Westhill (Arnhall Business Park), the Kirkhall Industrial Estate and Dyce Railway Station via Kingswells and Bucksburn. Interchange with Route 17 services at Bankhead for direct connections to Wellheads Industrial Estate and with ART services at TECA for the Airport

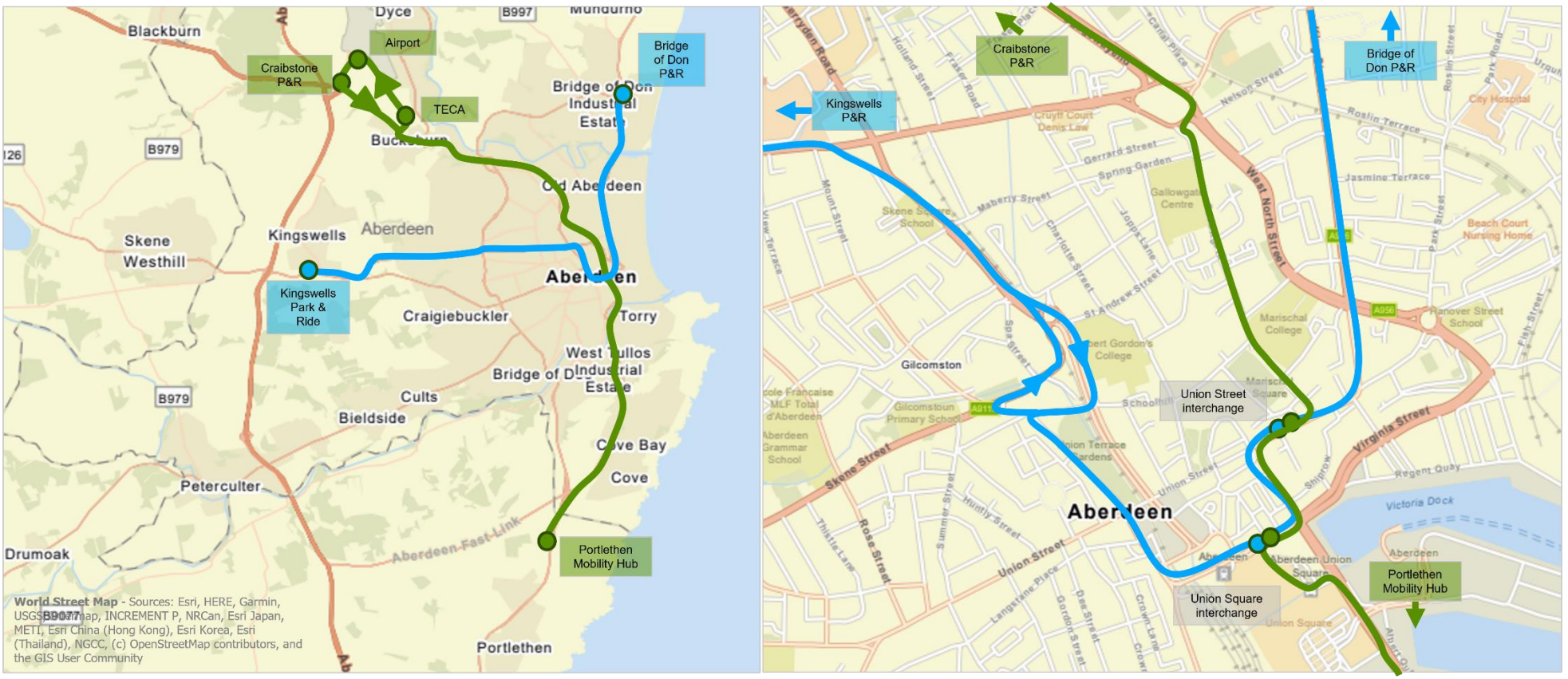


Figure 3: ART network in Test A1

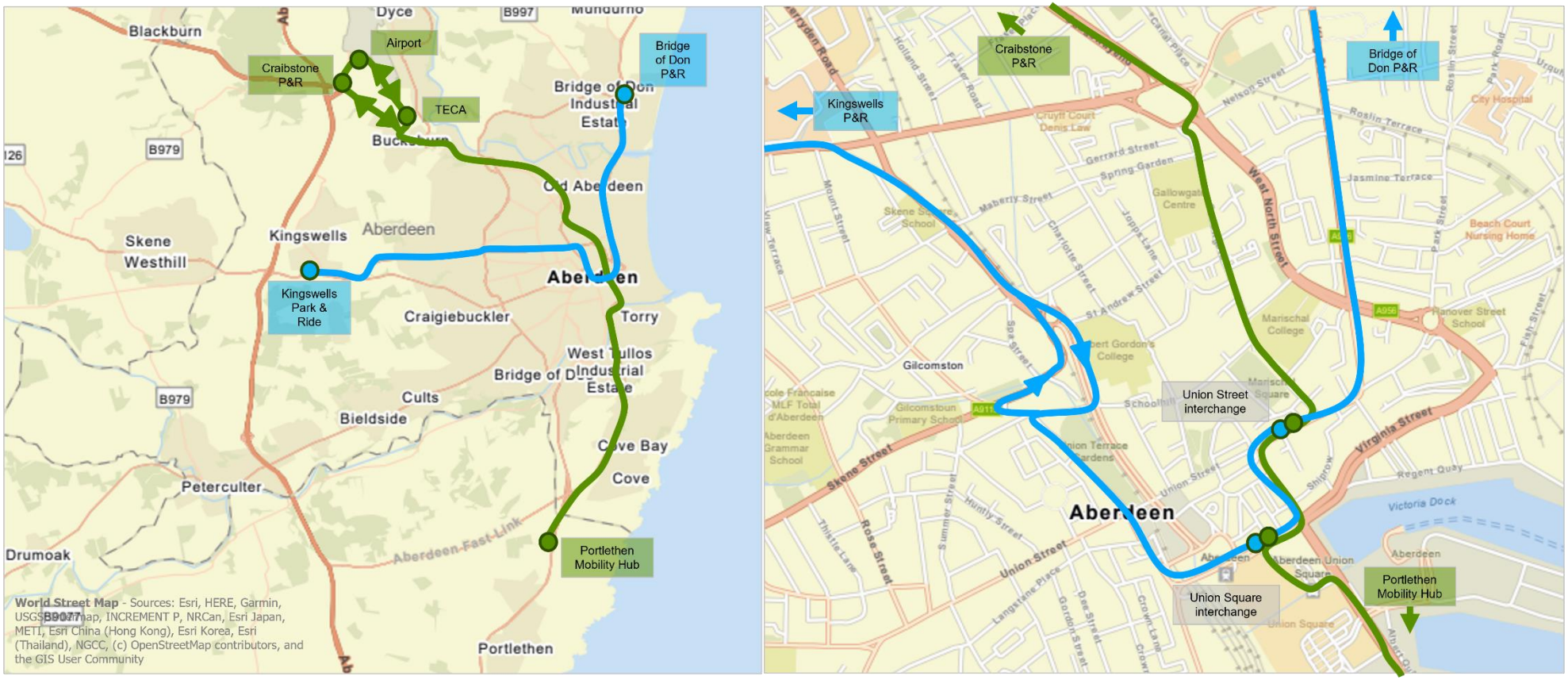


Figure 4: ART network in Test A2

Test B1

Route 1: Kingswells P&R (via Westburn Road, Lang Stracht) ***to*** *Cloverhill (via King Street, Ellon Road)*
Route 2: Craibstone P&R (via A96, Gough Burn Crescent) ***to*** *Portlethen Mobility Hub (via Victoria Road, Wellington Road)*

For Test B1, the only change when compared with the Core scenario, is an extension of ART from the Bridge of Don P&R site to the proposed development at Cloverhill which will deliver 400 residential units by 2030. With no city routes extending along Ellon Road north of the Parkway roundabout (see Figure 6) the city route changes proposed as part of the Core scenario (see Table 3) are applicable to Test B1.

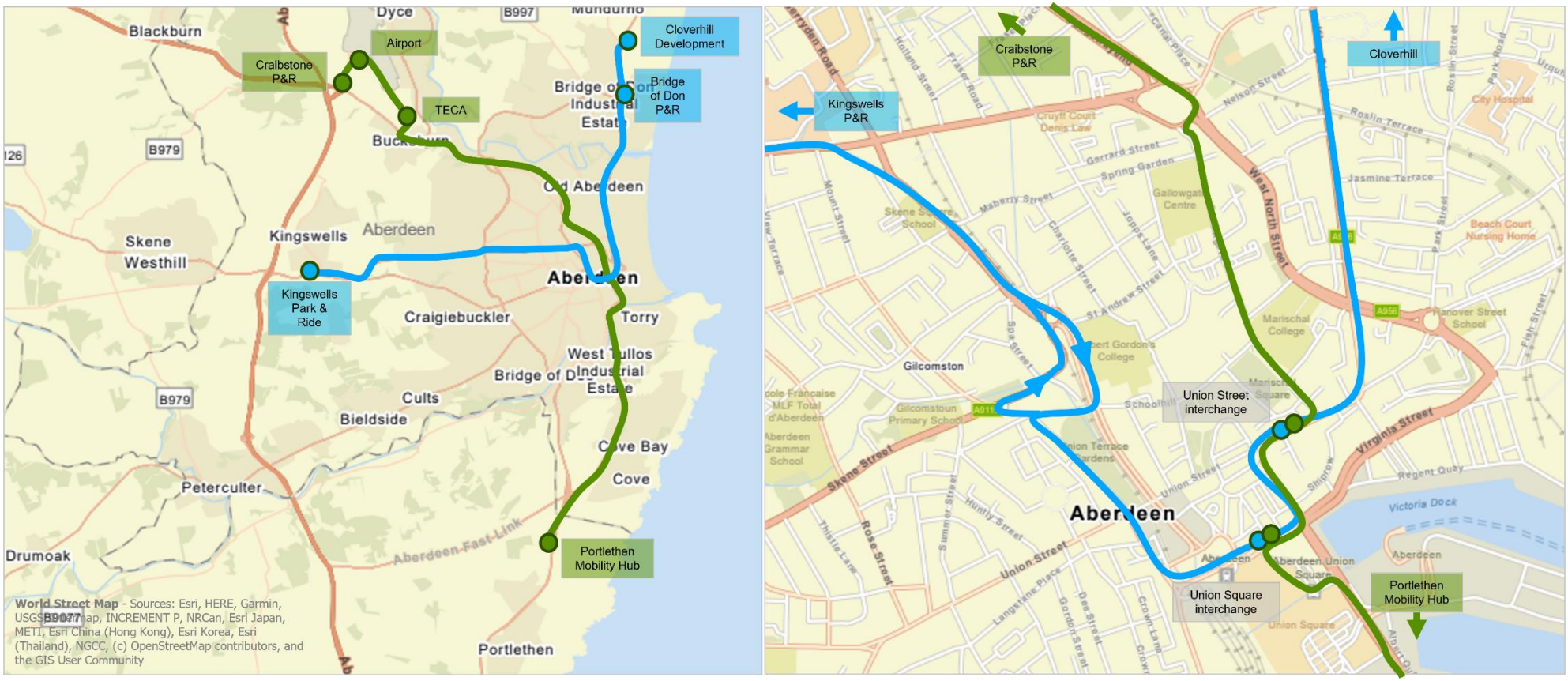


Figure 5: ART network in Test B1

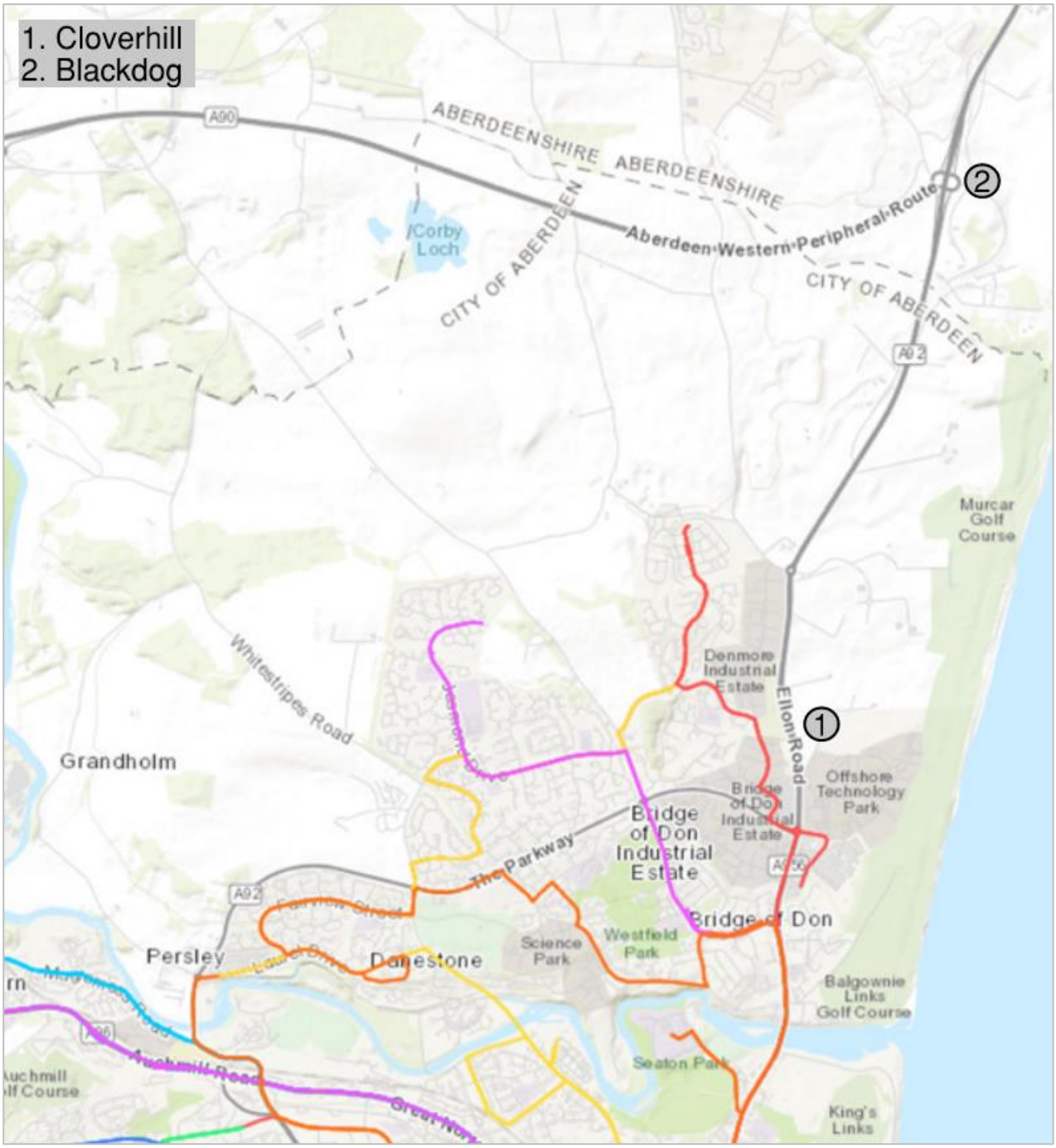


Figure 6: Existing city bus route serving the Bridge of Don

Test B2

Route 1: Kingswells P&R (via Westburn Road) ***to*** *Blackdog (via King Street, Ellon Road)*
Route 2 (Core): Craibstone P&R (via A96, Gough Burn Cres) ***to*** *Portlethen Mobility Hub (via Victoria Rd, Wellington Rd)*

For Test B2, the only change when compared to the Core scenario is an extension of ART from the Bridge of Don P&R to the proposed mixed-use development at Blackdog which will deliver 580 residential units by 2030.

As with Test B1, with no City routes extending along Ellon Road north of the Parkway roundabout (see Figure 6) the city route changes proposed as part of the Core Test (see Table 2) are also applicable to Test B2.

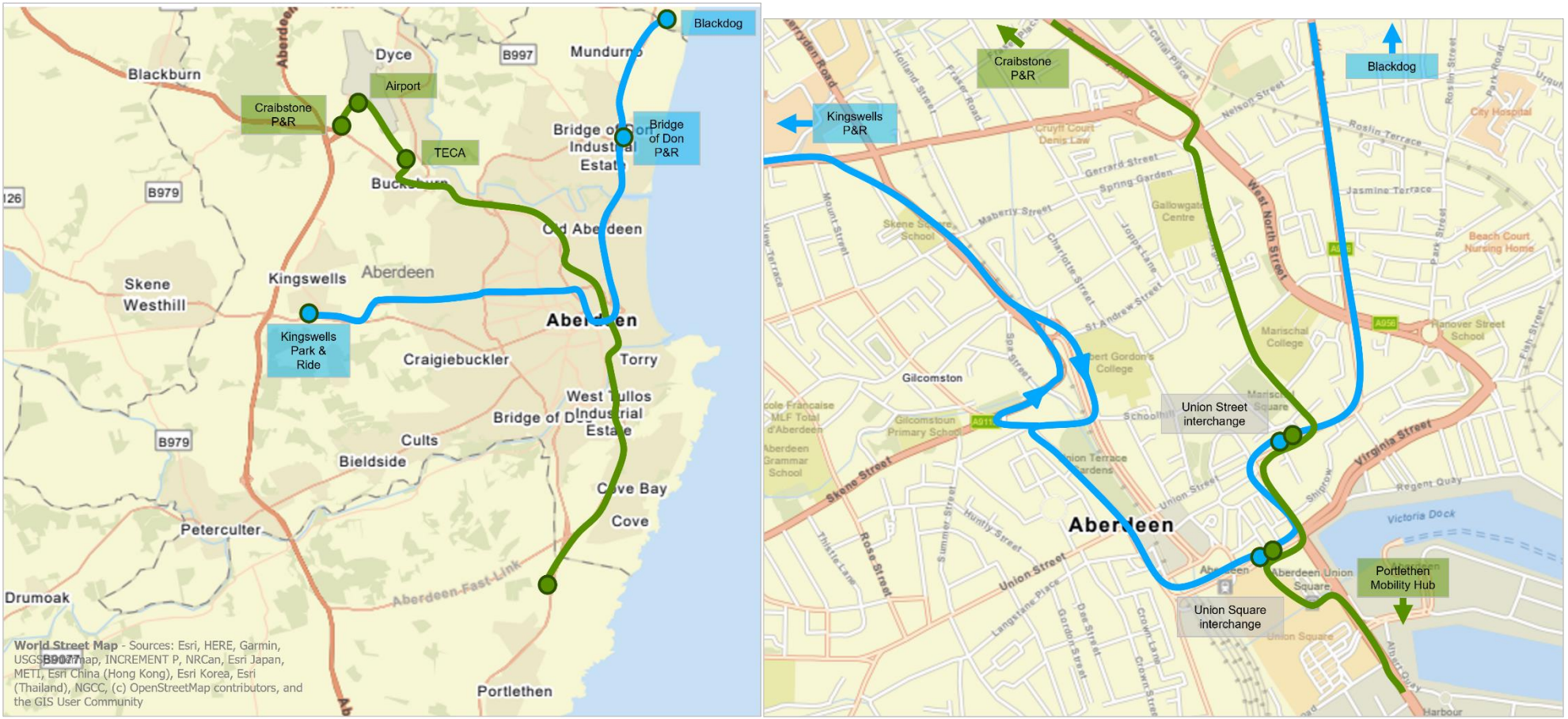


Figure 7: ART network in Test B2

Test C1

Route 1: Westhill (via A944, Westburn Road) to Bridge of Don P&R (via King Street)
Route 2 (Core): Craibstone P&R (via A96, Gough Burn Cres) to Portlethen Mobility Hub (via Victoria Rd, Wellington Rd)

For the Test C1, the only change when compared to the Core Test is an extension of ART from the Kingswells P&R to Westhill. This directly impacts Routes 5/ 5A[1] and 6/ 6A that serve Westhill, Arnhall Business Park and Echt with secondary impacts on Route 4 which operate along Queen's Road serving Prime Four, Countesswells and Route 11/11A which operate along Queen's Road serving Woodend (11)/ Craigiebuckler (11A).

The removal of Routes 5 and 6 create a loss of connectivity along Albyn Place and Queen's Road and to the peripheral residential areas in Westhill. The lost connections along Albyn Place and Queen's Road could be replaced by increasing the frequency of services on Routes 4 and 11. For Westhill, alternative ART services could make clockwise and anticlockwise routes via Westhill roundabout - Westhill Drive - Old Skene Road - Broadstraik Road - Straik Road - A944 - Westhill roundabout. The connection to Echt would be lost.

Table 4: Summary of changes to city routes to support the C1 route scenario

Service	Change	Comment
1	Modify	Overlap with ART on King Street. Modify route with alternate buses serving Danestone and Middleton Park with new connection to Middleton Park supporting removal of Route 2 (see below)
2	Remove	Overlap with ART on King Street. Lost connection to Middleton Park provided by modified Route 1 (see above)
3, 3A, 3B	Modify	Extend route to Sheddocksley to support removal of Route 59 (see below)
4	Modify	Extend route to improve connections to Kingswells and support removal of Route 14 (see below). Alternative services to Countesswells and Kingswells. Increase service frequency to restore connectivity to areas along Albyn Place and Queen's Road from the removal of Routes 5/5A and 6/6A (see below)
5, 5A	Remove	Overlap with ART on the A944 between the Jessiefield and Fairley Road junctions
6, 6A	Remove	Overlap with ART on the A944 between the Jessiefield and Fairley Road junctions
8	Remove	Route 1 (modified), Route 1B and Route 8A provide more direct connections between ARI, Danestone, Middleton Park and Shielhill/ Dubford while Route 7/7A/7B maintain connections to Stonehaven and Newtonhill
8A	Modify	Enhance service frequency to support removal of Route 8 (see above)
11, 11A	Modify	No overlap with ART. Increase service frequency to restore connectivity between city centre and areas along Albyn Place and Queen's Road as a result of removing Route 5/ 5A and Route 6/ 6A (see above)
14	Remove	Overlap with ART on Westburn Road and Lang Stracht. Routes 4 and 3/3A/3B provide alternative services
20	Remove	Overlap with ART on Market Street/ Wellington Road and parallel running on King Street. Lost connections to Torry/ Balnagask replaced by Routes 12 & 15
23	Modify	Overlap with ART on A944 and parallel running on A96. Remove western section (Sheddocksley), retain northern section (Hilton) and extend to Torry
59	Remove	Overlap with ART on Westburn Road. Lost connections to Northfield provided by Routes 3 and 12 and Torry by Route 12 and 23
172	Remove	Overlap with ART on the A96 (Bucksburn to George Street). Lost connects to Bucksburn provided by Route 17/17A and Stoneywood/ Dyce/ Ferryhill/ Kincorth by Route 18
727	Remove	Overlap with ART along the full length of A96 while also serving the Airport and Craibstone P&R. Lost connections provided by ART
X27	Remove	Overlap with ART along the A96 (Airport to Haudagain). Lost connections to Kirkhall Industrial Estate and Dyce provided by new Route A (see below)
New Route A	New	Provides a connection between Westhill (Arnhall Business Park), the Kirkhall Industrial Estate and Dyce Railway Station via Kingswells and Bucksburn.

[1] Route 5A extending to Echt

(Note 1-Table 2)	Interchange with Route 17 services at Bankhead for direct connections to Wellheads Industrial Estate and with ART services at TECA for the Airport

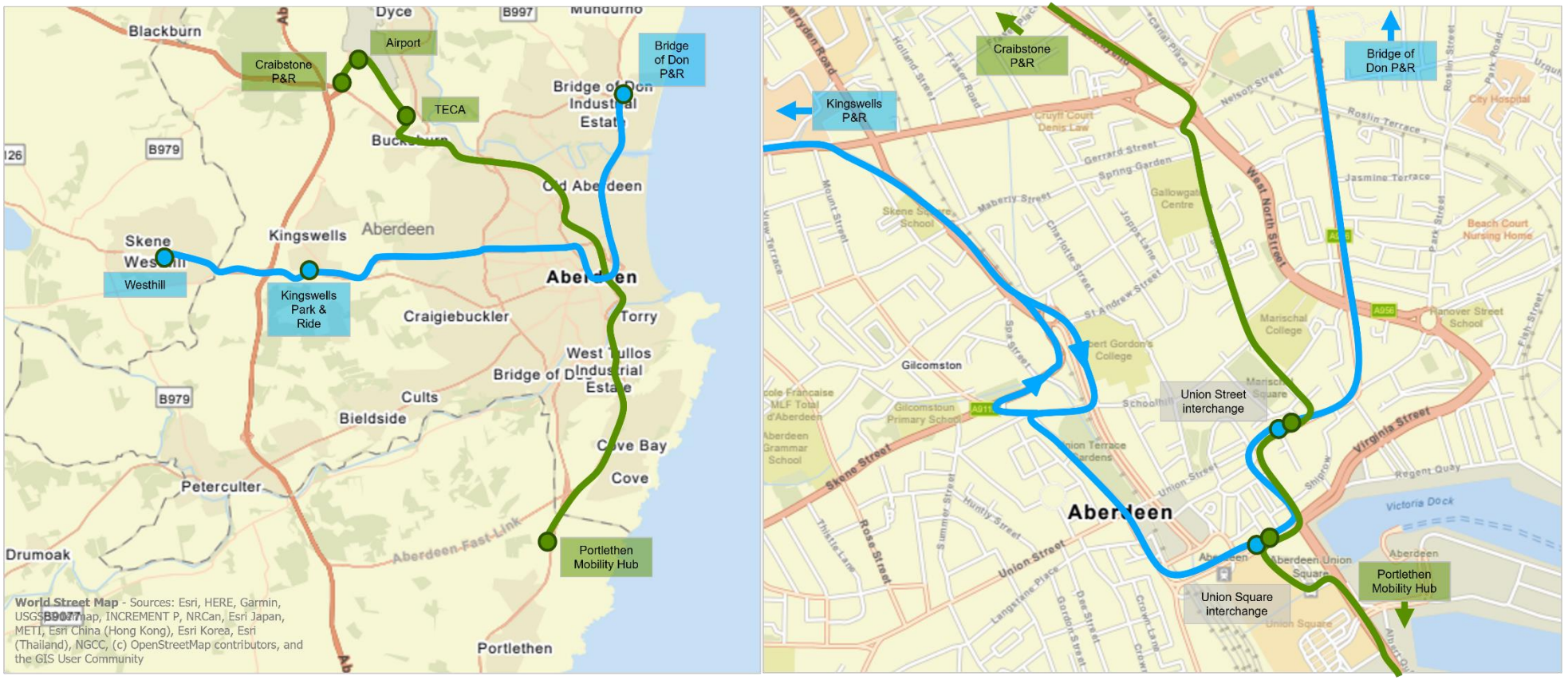


Figure 8: ART network in Test C1

Test C2

Route 1: Westhill (via Queens Road, Kingswells P&R) to Bridge of Don P&R (via King Street)
Route 2 (Core): Craibstone P&R (via A96, Gough Burn Cres) to Portlethen Mobility Hub (via Victoria Rd, Wellington Rd)

For Test C2, the change when compared to the Core Test is that ART services to Kingswells P&R operate along the A9119 (Albyn Place, Queen's Road and Skene Road) instead of the A944 (Western Road and Lang Stracht). This directly impacts Routes 4, 5/5A/, 6/6A and 11/11A which operate along Queen's Road serving Prime Four/ Countesswells, Westhill and Woodend/ Craigiebuckler respectively. While there are secondary impacts on:

- Routes 3/3A/3B and 59 which were removed as part of the Core scenario but now retained because of the reduced overlap with ART
- Route 23 was modified as part of the Core scenario but now retained as existing

Table 5: Summary of changes to city routes to support Test C2

Service	Change	Comment
1	Modify	Overlap with ART on King Street. Modify route with alternate buses serving Danestone and Middleton Park with new connection to Middleton Park supporting removal of Route 2 (see below)
2	Remove	Overlap with ART on King Street. Lost connection to Middleton Park provided by modified Route 1 (see above)
3, 3A, 3B	Retain	Route removed as part of the Core scenario but retained in this scenario to maintain connections to ARI
4	Remove	Overlap with ART on Queen's Road and Skene Road. Lost connection to Countesswells provided by modified Route 14 (see below)
5, 5A	Remove	Overlap with ART on the A944 between the Jessiefield and Fairley Road junctions
6, 6A	Remove	Overlap with ART on the A944 between the Jessiefield and Fairley Road junctions
8	Remove	Route 1 (modified), Route 1B and Route 8A provide more direct connections between ARI, Danestone, Middleton Park and Shielhill/ Dubford while Route 7/7A/7B maintain connections to Stonehaven and Newtonhill
8A	Modify	Enhance service frequency to support removal of Route 8 (see above)
11, 11A	Remove	Overlap with ART on Queen's Road with lost connections to Berryden, Cummings Park and Northfield. ART provides connections to Woodend and Craigiebuckler, Route 12 connects Berryden, Route 3 (modified) connects Cummings Park and Route 3 (modified) connects Northfield
14	Modify	Limited overlap with ART along Union Street so retain route but extend and provide alternate services between Kingswells and Countesswells to support removal of Route 4 (see above)
20	Remove	Overlap with ART on Market Street/ Wellington Road and parallel running on King Street. Lost connections to Torry/ Balnagask replaced by Routes 12 & 15
23	Retain	Previously modified route in Core scenario is retained as existing in this scenario because of the reduced overlap with ART on Westburn Road
59	Retain	Previously removed route in the Core scenario is retained as existing because of the reduced overlap with ART on Westburn Road
172	Remove	Overlap with ART on the A96 (Bucksburn to George Street). Lost connects to Bucksburn provided by Route 17/17A and Stoneywood/ Dyce/ Ferryhill/ Kincorth by Route 18
727	Remove	Overlap with ART along the full length of A96 while also serving the Airport and Craibstone P&R. Lost connections provided by ART
X27	Remove	Overlap with ART along the A96 (Airport to Haudagain). Lost connections to Kirkhall Industrial Estate and Dyce provided by new Route A (see below)
New Route A (Note 1- Table 2)	New	Provides a connection between Westhill (Arnhall Business Park), the Kirkhall Industrial Estate and Dyce Railway Station via Kingswells and Bucksburn. Interchange with Route 17 services at Bankhead for direct connections to Wellheads Industrial Estate and with ART services at TECA for the Airport

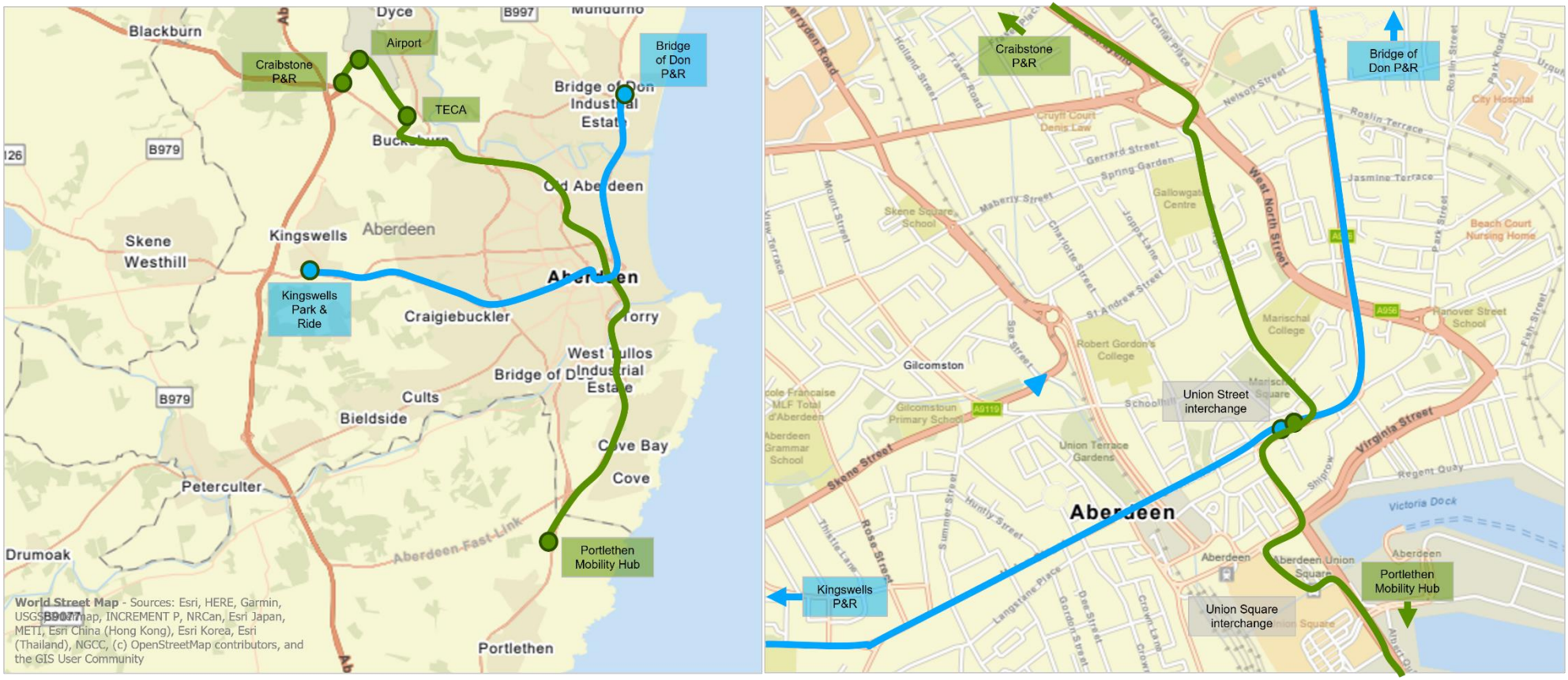


Figure 9: ART network in Test C2

Test D

Route 1: Craibstone P&R (via A96, Gough Burn Crescent) to Portlethen Mobility Hub (via Holburn St, West Tullos Road)
Route 2 (Core): Kingswells P&R (via Westburn Road, Lang Stracht) to Bridge of Don P&R (via King Street)

For Test D, the change when compared to the Core Test is that ART services to Portlethen Mobility Hub operate along Holburn Street, Great Southern Road and West Tullos Road rather than Market Street, Menzies Road and Wellington Road. This directly impacts Route 18 and 172 of which both have an increased overlap with ART along Holburn Street and Great Southern Road. The proposal is to remove Route 18 and maintain the removal of Route 172 which has a greater overlap with ART compared to the Core scenario.

Removal of ART from Market Street, Menzies Road and Wellington Road supports retaining Route 3/3A/3B while keeping the proposed extension of the route into Sheddocksley to support the removal of Route 59.

Table 6: Summary of changes to city routes to support Test D

Service	Change	Comment
1	Modify	Overlap with ART on King Street. Modify route with alternate buses serving Danestone and Middleton Park with new connection to Middleton Park supporting removal of Route 2 (see below)
2	Remove	Overlap with ART on King Street. Lost connection to Middleton Park provided by modified Route 1 (see above)
3, 3A, 3B	Modify	Extend route to Sheddocksley to support removal of Route 59 (see below)
4	Modify	Extend route to improve connections to Kingswells and support removal of Route 14 (see below). Alternative services to Countesswells and Kingswells
8	Remove	Route 1 (modified), Route 1B and Route 8A provide more direct connections between ARI, Danestone, Middleton Park and Shielhill/ Dubford while Route 7/7A/7B maintain connections to Stonehaven and Newtonhill
8A	Modify	Enhance service frequency to support removal of Route 8 (see above)
14	Remove	Overlap with ART on Westburn Road and Lang Stracht. Routes 4 and 3/3A/3B provide alternative services
18	Remove	Overlap with ART along A96 and increased overlap on Holburn Street and Great Southern Road
20	Remove	Overlap with ART on Market Street/ Wellington Road and parallel running on King Street. Lost connections to Torry/ Balnagask replaced by Routes 12 & 15
23	Modify	Overlap with ART on A944 and parallel running on A96. Remove western section (Sheddocksley), retain northern section (Hilton) and extend to Torry
59	Remove	Overlap with ART on Westburn Road. Lost connections to Northfield provided by Routes 3 and 12 and Torry by Route 12 and 23
172	Remove	Overlap with ART on the A96 (Bucksburn to George Street) but also Holburn Street and Great Southern Road
727	Remove	Overlap with ART along the full length of A96 while also serving the Airport and Craibstone P&R. Lost connections provided by ART
X27	Remove	Overlap with ART along the A96 (Airport to Haudagain). Lost connections to Kirkhall Industrial Estate and Dyce provided by new Route A (see below)
New Route A (Note 1- Table 2)	New	Provides a connection between Westhill (Arnhall Business Park), the Kirkhall Industrial Estate and Dyce Railway Station via Kingswells and Bucksburn. Interchange with Route 17 services at Bankhead for direct connections to Wellheads Industrial Estate and with ART services at TECA for the Airport

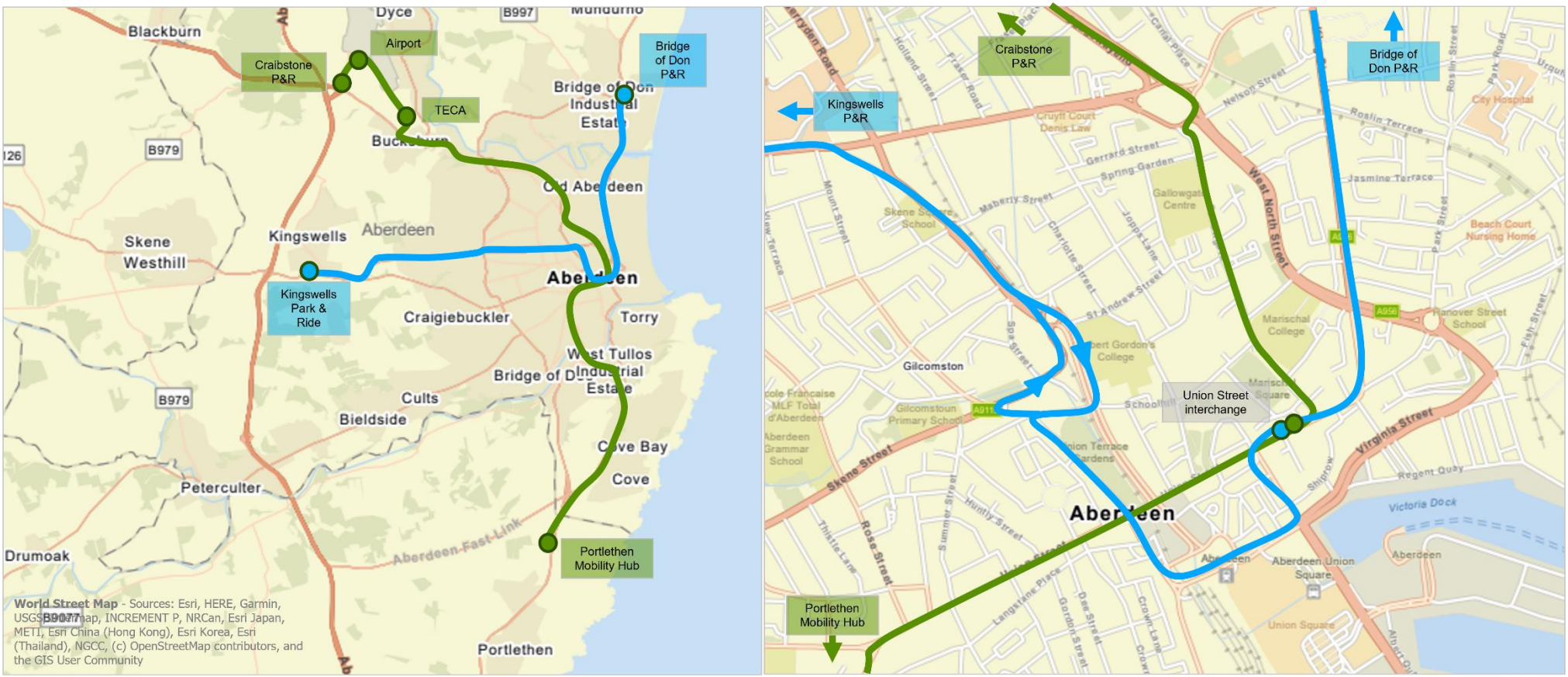


Figure 10: ART network in Test D

Test E

Route 1: Kingswells P&R (via Westburn Road, Lang Stracht) to Craibstone P&R (via A96)
Route 2: Bridge of Don P&R (via King Street) to Portlethen Mobility Hub (via Victoria Road, Wellington Road)

For Test E, there is no change to City routes when compared to the Core Test because the only difference relates to the configuration of the cross-City routes. For example, Route 1 in the Core scenario links Craibstone P&R to Portlethen Mobility Hub and Route 2 links Kingswells P&R to Bridge of Don P&R all via the city centre. These are the same destinations as above but are paired differently.

Changes to the local bus network deemed necessary to support Test E is summarised in Table 2.

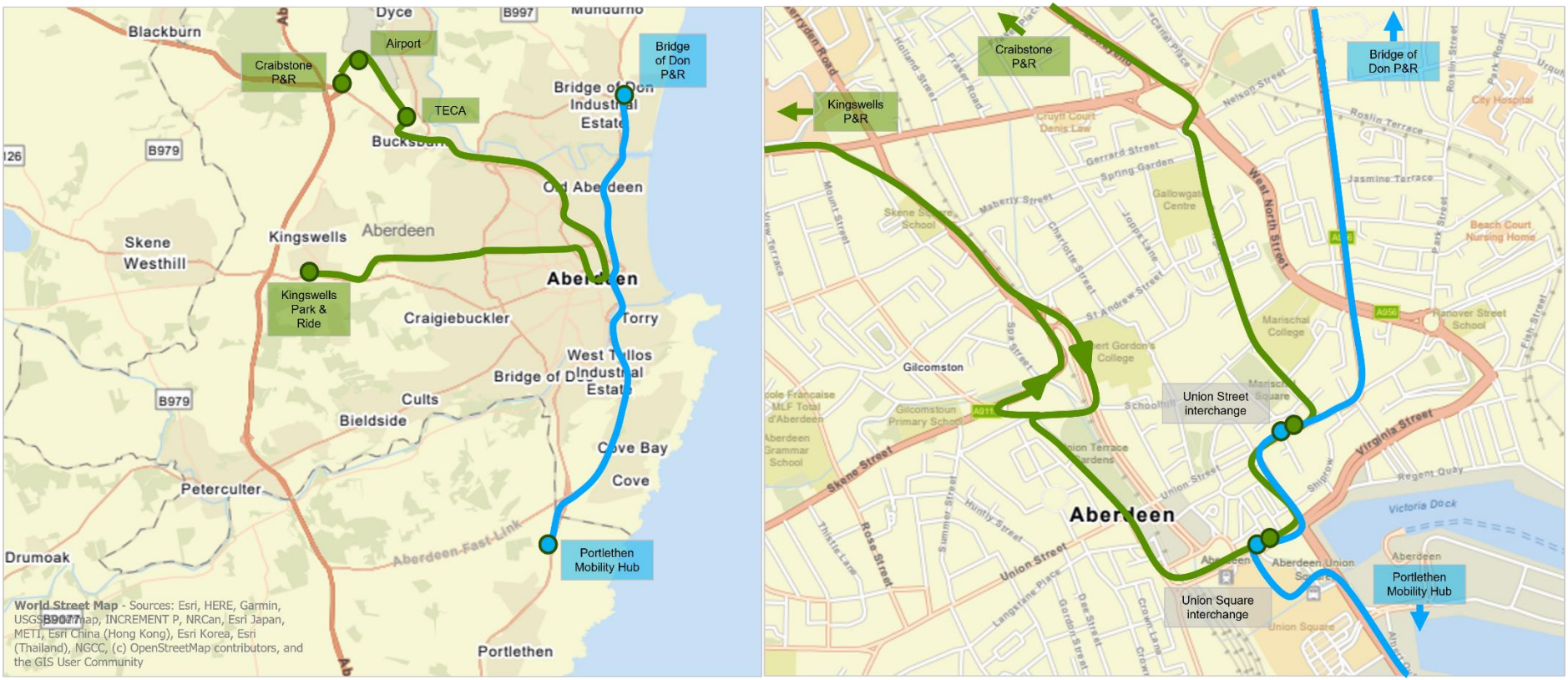


Figure 11: ART network in Test E

Test F

Route 1 (Core): Craibstone P&R (via A96, Gough Burn Cres) to Portlethen Mobility Hub Mobility Hub (via Victoria Rd, Wellington Rd)
Route 2: Bridge of Don P&R (via King Street) to RGU (via Garthdee Road)
Route 3: Kingswells P&R (via Westburn Road, Lang Stracht) to Beach (via Beach Esplanade)

For Test F, the change when compared to the Core Test is that ART extends the Bridge of Don P&R route to the Robert Gordon University campus (rather than to Westhill) and the Kingswells P&R route to the proposed Beach development (rather than the Bridge of Don). When the Core route between Craibstone P&R to Portlethen Mobility Hub is included, this creates an ART network with three cross city routes.

This directly impacts Route 1/1B as there is an increased overlap with ART south of the city along Holburn Street and Garthdee Road. It is proposed to remove Route 1B and further modify Route 1 (c.f. the Core Test) by removing the Garthdee Road loop and have services operating two-way along Auchinyell Road and Broomhill Road. This two-way operation also supports the removal of Route 2 proposed by the Core Test. It is proposed that the removal of Route 1B is supported with a further modification to Route 8A which extends the route from the Foresterhill Health Campus to the city centre. No routes currently serve the Beach area so the extension of ART to this development area will have no impact on the local bus network.

Table 7: Summary of changes to city routes to support Test F

Service	Change	Comment
1	Modify	Overlap with ART on King Street. Modify route with alternate buses serving Danestone and Middleton Park with new connection to Middleton Park supporting removal of Route 2 (see below). With the increased overlap with ART on Holburn Street and Garthdee Road the Garthdee Road loop is removed with services now two-way along Auchinyell Road and Broomhill Road
1B	Remove	Overlap with ART on King Street and Holburn Street and Garthdee Road. Connections to Dubford and Shielhill would be lost but these could be provided by Route 8
2	Remove	Overlap with ART on King Street. Lost connection to Middleton Park provided by modified Route 1. The proposed two-way operation of Route 1 along Auchinyell Road and Broomhill Road mitigates the loss of connectivity
3, 3A, 3B	Modify	Extend route to Sheddocksley to support removal of Route 59 (see below)
4	Modify	Extend route to improve connections to Kingswells and support removal of Route 14 (see below). Alternative services to Countesswells and Kingswells
8	Remove	Route 1 (modified), Route 1B and Route 8A provide more direct connections between ARI, Danestone, Middleton Park and Shielhill/ Dubford while Route 7/7A/7B maintain connections to Stonehaven and Newtonhill
8A	Modify	Enhance service frequency to support removal of Route 8 but also extend route from the ARI to city centre to support removal of Route 1B (see above)
14	Remove	Overlap with ART on Westburn Road and Lang Stracht. Routes 4 and 3/3A/3B provide alternative services
20	Remove	Overlap with ART on Market Street/ Wellington Road and parallel running on King Street. Lost connections to Torry/ Balnagask replaced by Routes 12 & 15
23	Modify	Overlap with ART on A944 and parallel running on A96. Remove western section (Sheddocksley), retain northern section (Hilton) and extend to Torry
59	Remove	Overlap with ART on Westburn Road. Lost connections to Northfield provided by Routes 3 and 12 and Torry by Route 12 and 23
172	Remove	Overlap with ART on the A96 (Bucksburn to George Street). Lost connects to Bucksburn provided by Route 17/17A and Stoneywood/ Dyce/ Ferryhill/ Kincorth by Route 18
727	Remove	Overlap with ART along the full length of A96 while also serving the Airport and Craibstone P&R. Lost connections provided by ART
X27	Remove	Overlap with ART along the A96 (Airport to Haudagain). Lost connections to Kirkhall Industrial Estate and Dyce provided by new Route A (see below)
New Route A (Note 1)	New	Provides a connection between Westhill (Arnhall Business Park), the Kirkhall Industrial Estate and Dyce Railway Station via Kingswells and Bucksburn.

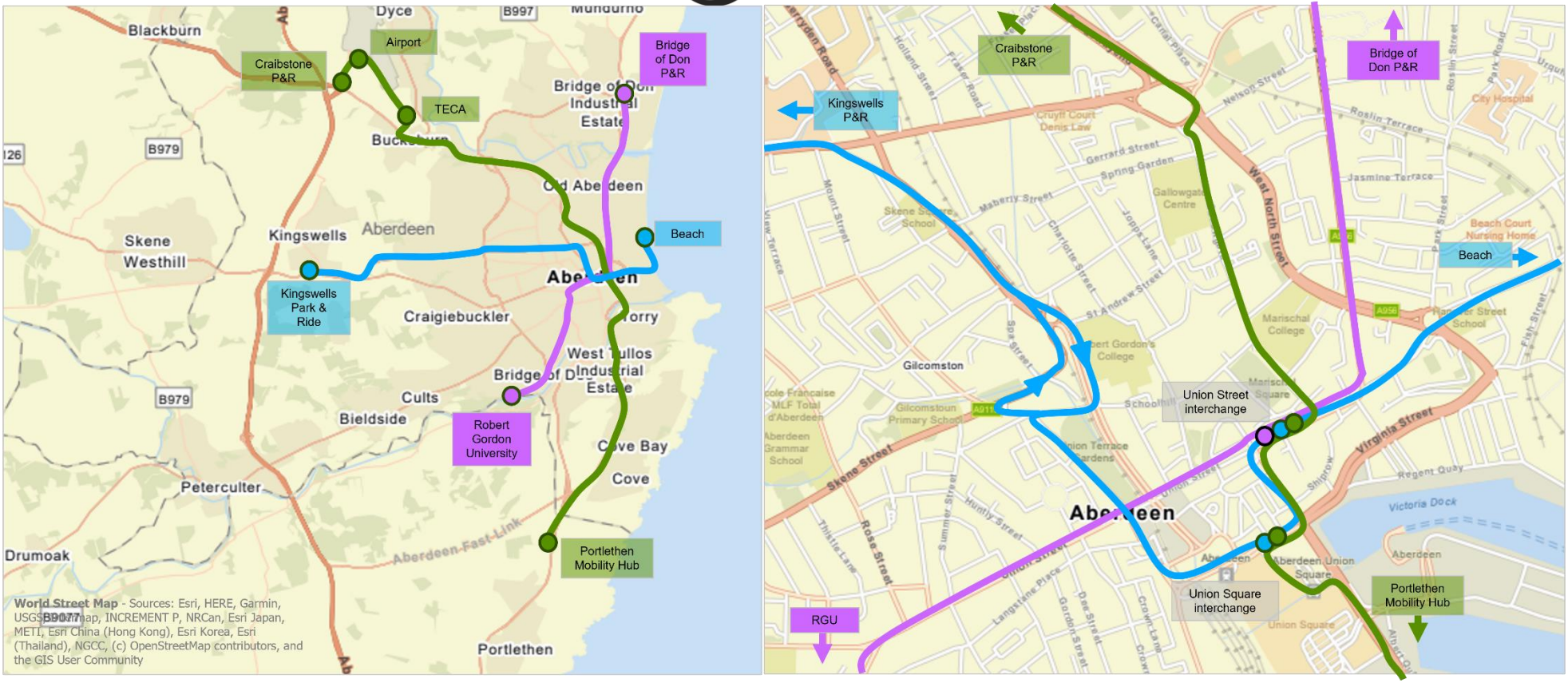


Figure 12: ART network in Test F

Summary

This Note sets out the changes to local bus routes in Aberdeen to support the testing of 10 ART route tests in ASAM19 to inform the Routeing Analysis.

The Core Test is based on two cross-city routes with subsequent tests making small but significant changes to one or both of the Core routes. Two of the tests investigate either an alternative crosscity service alignment or additional destinations at Robert Gordon University and the proposed Beach Development.

To implement the ART tests, changes would be required to local bus routes to integrate ART services and avoid a duplication of existing bus routes which would lead to inefficient bus operations and a less commercially viable city-wide network.

The local bus network in Aberdeen consists of city and long distance routes where long distance routes extend beyond the proposed ART network. It was decided therefore to retain these routes and only make changes to the city routes where overlap with the ART was more substantial and so potentially have a greater impact on local bus network viability.

This Note sets out the possible changes to the local bus network required to respond to each test. This was achieved by reviewing each city bus route and defining them either for retention, removal or modification depending on the extent of the route overlap, parallel running or mitigation (route extensions, service frequency increases, etc.) required.

The results of this review are set out in Table 2 to Table 7 for each of the tests.

It should be noted that the bus route changes proposed for each test provide a high level assessment suitable for inclusion within the ASAM19 modelling to understand the preferred ART routing. It is recommended that if further testing of a preferred option is undertaken, the assessment is repeated with involvement from the bus operators to better understand the wider implications of the route changes required to accommodate ART.

Appendix A: City and Long Distance Bus Routes in Aberdeen

Routes	Operator	Destinations
City Routes		
1	First	Danestone – Bridge of Don – King Street -Aberdeen – Holburn Street - Garthdee - RGU (Auchinyell Road/ Broomhill Road loop)
1B	First	Shielhill/ Dubford - Bridge of Don – King Street - Aberdeen Holburn Place – RGU
2	First	Middleton Park - Bridge of Don – Aberdeen – Garthdee - RGU (Auchinyell Road/ Broomhill Road loop)
3, 3A, 3B	First	Mastrick – ARI - Mid Stocket - Rosemount - Aberdeen – South Loirston (3) / Cove (3A)/ Altens Industrial Estate (3B)
4	Stagecoach	Countesswells - Prime Four - Craigiebuckler - Aberdeen
5, 5A	Stagecoach	(Echt - A) - Westhill – Arnhall Business Park - Prime Four - Craigiebuckler - Aberdeen
6, 6A	Stagecoach	Westhill - Arnhall Business Park - Prime Four - Craigiebuckler - Aberdeen
8	First	ARI – Aberdeen - Tillydrone - Danestone – Middleton Park - Shielhill/ Dubford
8A		ARI – Danestone – Tillydrone - Danestone - Middleton Park - Shielhill/ Dubford
11, 11A	First	Northfield – Cummings Park - Berryden - Aberdeen – Woodend (11) / Craigiebuckler (11A)
12	First	Heathryfold – Hilton - Berryden - Aberdeen - Torry
13	First	Heathryfold – Mastrick – King's Gate - Aberdeen - Footdee/ Hillhead of Seaton (via Golf Road)
14	Stagecoach	Kingswells – Lang Stracht - Mid Stocket - Rosemount - Aberdeen
15, 15A/B	Stagecoach, First	Airyhall/ Craigiebuckler – Aberdeen - Torry
16B	First	Robert Gordon Playing Field - Airyhall - Mannofield - Aberdeen
17, 17A	First	Dyce – Wellheads - Stoneywood - Newhills - A96 - Aberdeen - Ferryhill - Kincorth
18	First	Dyce - Wellheads - Stoneywood - Bankhead – Mugiemoss - Haudagain - A96 - Mounthooly - Aberdeen - Ferryhill - Kincorth - Altens Industrial Estate
19	First	Tillydrone – Aberdeen – Cults – Bieldside – Milltimber - Peterculter
20	First	Hillhead of Seaton - Aberdeen University - Aberdeen - Torry/ Balnagask
23	First	Heathryfold/ Northfield - Hilton – Mounthooly -Aberdeen - Mid Stocket - A944 - Sheddocksley
31	First	School service
52	First	School service
59	Stagecoach	Heathryfold/ Northfield - ARI - Westburn Road - Aberdeen - Torry
62	First	School service
172	First	Dyce - Wellheads - Stoneywood – Newhills – A96 - Kittybrewster - Aberdeen - Ferryhill - Kincorth
181, 182, 183	First	School services
727	Stagecoach	Aberdeen – Mounthooly - Kittybrewster - A96 -TECA - Airport
X27	First	Aberdeen – Rosemount - Hilton - A96 - TECA – Airport - Kirkhall - Dyce
Long Distance Routes		
7[(1)], 7A, 7B, 7S	Stagecoach	Stonehaven - Aberdeen
8A, 8C	Stagecoach	Stonehaven – local service (outside the study area)
9	Stagecoach	Inverurie - Aberdeen
10, 10B	Stagecoach	Inverness - Aberdeen
21A	Stagecoach	Local Cove Bay service

Routes	Operator	Destinations
22, 22A, 22B	Stagecoach	Local Inverurie service
35	Stagecoach	Elgin - Aberdeen
37	Stagecoach	Inverurie - Aberdeen
49	Stagecoach	Inverurie - Ellon (outside study area)
50	Stagecoach	Ellon - Aberdeen
53, 53A	Stagecoach	Ellon - Aberdeen
61	Stagecoach	Peterhead - Aberdeen
64	Central Taxis	North Tarbothill - Aberdeen
68	Stagecoach	Fraserburgh - Aberdeen
70A, 70B, 70C	Stagecoach	Portlethen - Newtonhill
201	Stagecoach	Retain. Braemar - Aberdeen
218	Stagecoach	Alford - Aberdeen
220	Stagecoach	Alford - Aberdeen
290	Stagecoach	Aberdeen – Methlick
291	Stagecoach/ Watermill	Aberdeen – Methlick
M9	Stagecoach (Megabus)	Glasgow - Aberdeen
M92	Stagecoach (Megabus)	Edinburgh - Aberdeen
X7	Stagecoach	Perth - Aberdeen
X20	Stagecoach	Kemnay or Alford- Aberdeen
X60	Stagecoach	Peterhead - Aberdeen
X63	Stagecoach	Peterhead - Aberdeen
X67	Stagecoach	Fraserburgh - Aberdeen
X68	Stagecoach	Fraserburgh - Aberdeen