07/03/2024

SOUTH COLLEGE STREET JUNCTION IMPROVEMENTS PROJECT (PHASE 2)

OPTION APPRAISAL REPORT

SYSTRA

SOUTH COLLEGE STREET JUNCTION IMPROVEMENTS PROJECT (PHASE 2)

OPTION APPRAISAL REPORT

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1. INTRODUCTION

1.1 Background

1.1.1 SYSTRA Ltd (SYSTRA) was commissioned by Aberdeen City Council (ACC) to undertake a proportionate STAG (Scottish Transport Appraisal Guidance) appraisal of options for a transport improvement (particularly active travel and public transport improvements) at the Queen Elizabeth Bridge/North Esplanade West roundabout.

1.1.2 The South College Street corridor is subject to an on-going series of improvements to road capacity and active travel modes to facilitate the introduction of the City Centre Masterplan. Outcomes from the City Centre Masterplan (CCMP) study were initially reported to Aberdeen City Council - Communities, Housing and Infrastructure Committee on 8 November 2017. Members recommended the approval of an interim South College Street scheme (Phase 1) that did not include changes to the Queen Elizabeth Bridge/North Esplanade West roundabout. Members did however approve the principle of a traffic signal junction at this location and instructed the then Head of Planning and Sustainable Development to take forward a review of the junction arrangement on completion of the AWPR and subsequent to the development of a new roads hierarchy. With both the AWPR and road hierarchy now complete, this commission will progress Phase 2 of the South College Street Scheme and focus on improvements to the Queen Elizabeth Bridge/North Esplanade West roundabout.

1.1.3 ACC has requested the development of a costed option for an effective, feasible, and deliverable intervention that has demonstrable benefits for all modes that the local authorities and partners can develop into a plan for design and implementation.

1.1.4 This report details the assessment process undertaken through to the development of a preferred option for the junction.

1.2 Methodology for Assessment

1.2.1 The appraisal is an objective-led study based on Scottish Transport Appraisal Guidance (STAG) principles. It is important to note that this is not a full STAG in itself. The assessment process follows these steps:

- Identify baseline data and existing problems and opportunities
- Collate Do-Minimum information – e.g. junction flow, future infrastructure
- Review Problems ,Opportunities, Issues and Constraints
- Set objectives
- High-level sifting
- Option Development, Modelling & Appraisal
- Consultation
- Final Option

2. REVIEW OF EXISTING CONDITIONS

2.1 Introduction

2.1.1 The junction is a four-arm roundabout in Aberdeen city centre connecting the key routes of Queen Elizabeth Bridge (A956), North Esplanade West (A956), Riverside Drive, and South College Street – See Figure 1.

Figure 1. Study Area

2.1.2 The junction is a key location in the updated Aberdeen Roads Hierarchy (2019):

- Primary route function on QE Bridge (from A956 Wellington Road) and North Esplanade West and key harbour freight route
- Secondary route function on South College Street and Riverside Drive
- All routes through the junction provide access to and from the city centre
- The future operation of the junction is also critical to facilitating traffic around the network that has been displaced from the core area of the city centre, including from the City Centre Masterplan traffic restriction proposals.

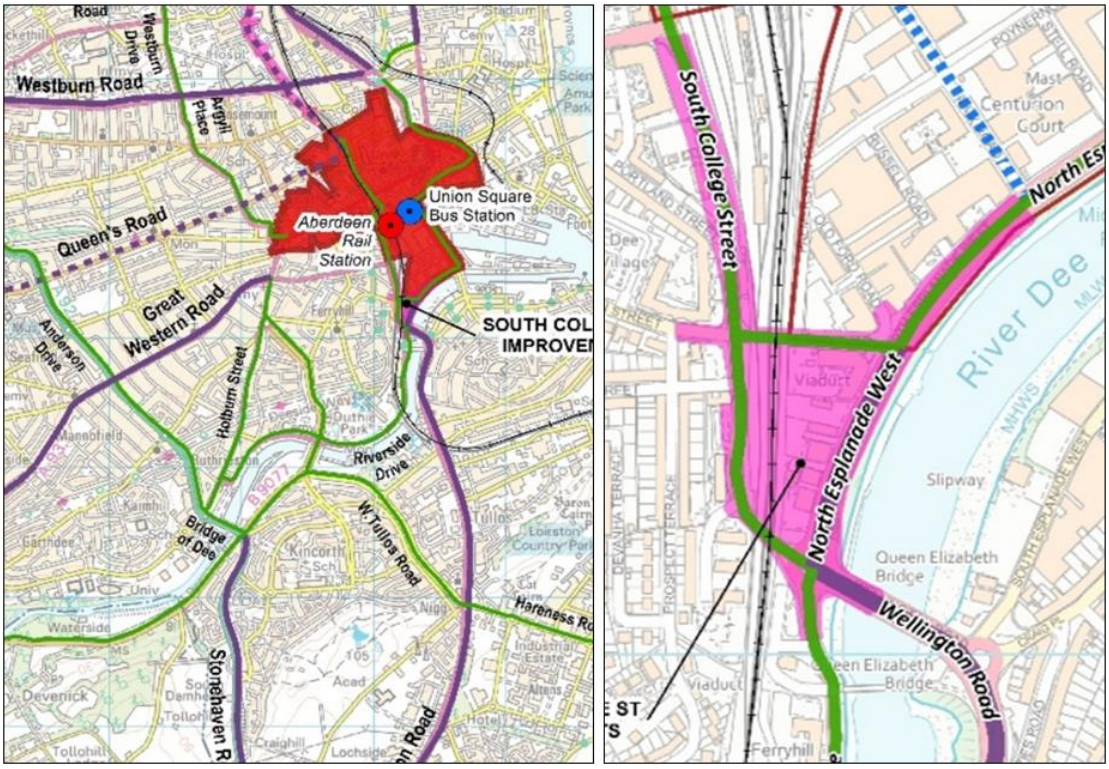


Figure 2. Updated Aberdeen Roads Hierarchy

2.1.3 To undertake the option development process, it is important to firstly examine the existing situation and how all users currently utilise the junction. However, at present (March 2023), the Phase 1 improvements are still under construction and are due to open by Summer 2023.

2.1.4 Phase 1 of the improvements include changes to South College Street, Riverside Drive, Palmerston Place and North Esplanade west. They do not include changes to the roundabout itself at Riverside Drive / QE Bridge.

2.1.5 This phase 2 study will therefore take cognisance of the works that are almost complete as part of the baseline network review. The Phase 1 works are detailed in the following section.

2.2 South College Street – Phase 1 – Committed Infrastructure

2.2.1 The impact of the proposed changes within the city centre area as part of the City Centre Masterplan (CCMP) have previously been assessed through traffic modelling. This identified a number of transport network changes required to support the Masterplan, including upgrading of the traffic capacity at the South College Street / North Esplanade West junction.

2.2.2 To provide additional capacity, the roundabout at the junction itself was not amended, but a new link road was designed between South College Street and North Esplanade West utilising the existing Palmerston Place – (See Figure 3), thus creating an alternative route between these two corridors that didn't impact on the roundabout itself.

2.2.3 As detailed in Figure 3 and Figure 4, the Phase 1 project consists of several key elements, including:

- An additional traffic lane along South College Street, between Bank Street and Wellington Place
- An additional traffic lane on Palmerston Place

- A new traffic signal controlled junction at the intersection of Palmerston Place / North Esplanade West
- The alteration of the existing traffic signal-controlled junctions at the South College Street/ Wellington Place junction and South College Street/ Milburn Street/ Palmerston Place junction adding additional approach lanes and improving operational coordination
- New and altered walking and cycling infrastructure along South College Street and Palmerston Place
- Reconfigured parking and loading areas on South College Street between Milburn Street and Riverside Drive

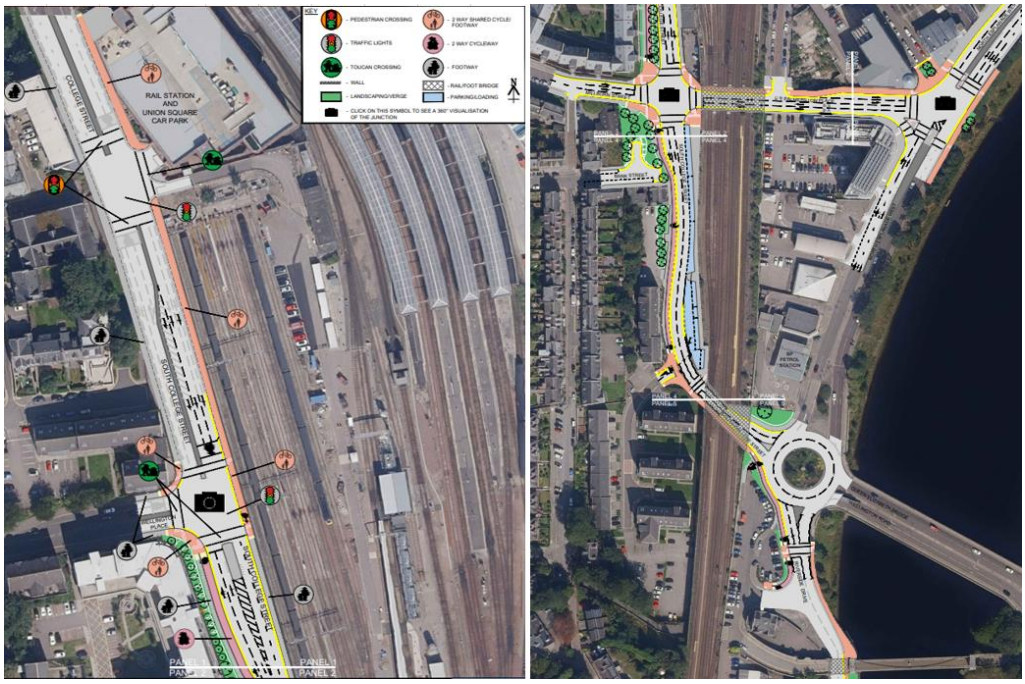


Figure 3. South College Street – Phase 1 Design

2.2.4 The Phase 1 cycle & pedestrian provisions include a mixture of segregated and shared footway provisions alternating on the east and west side of South College Street and also on the north side of Palmerston Place to link with the new signalised junction on North Esplanade West.

2.2.5 Segregated cycle provisions are also provided on the west side of Riverside Drive, north of the Car Park, to allow connectivity with the Wellington Suspension Bridge– see Figure 4. A shared Cycle and pedestrian path is also provided on the east side of Riverside Drive, from the Toucan crossing south along the river side.

Figure 4. South College Street – Phase 1 Design

2.3 Walking and Wheeling

2.3.1 The current walking and wheeling experience at the junction is influenced by its size, geometry and crossing opportunities.

2.3.2 There are footway provisions on all arms of the junction with formal signalised remote crossings on Riverside Drive (single crossing) and North Esplanade West (staggered crossing with central reserve).

2.3.3 There are uncontrolled crossing points (including drop kerbs and tactile paving) on QE Bridge and South College Street, just offset from the main junction – See Figure 5. These uncontrolled crossing points have narrow central reserves, which are below minimum standards for a refuge island (<2m wide). Traffic flows are high at these locations and there is likely to be pedestrians who do not feel safe to cross at these locations.

Figure 5. Uncontrolled Crossing Locations (Source: © 2023 Google)

2.3.4 There are pedestrian guard railings on the west side of Riverside Drive to guide pedestrians to cross South College Street at the uncontrolled crossing point. Whilst this was historically for pedestrian safety, their use does not align with the current design approach to pedestrian movement and they could be perceived as frustrating or not conducive to a welcoming pedestrian area. They also force pedestrians around the junction rather than through it but are designed to safely guide pedestrians to the appropriate crossing points.

2.3.5 There is also a formal signalised remote crossing on South College Street approximately 55m from the junction.

2.3.6 The Phase 1 improvements do not provide any additional crossing provisions at the junction. The footway on the west side of Riverside Drive and through to South College Street is to be

widened as part of the works. This includes the footway under the railway bridge on South College Street. These footway widened locations are to accommodate both pedestrians and cyclists sharing the available space (as detailed in Figure 4). South of the Rail Bridge, pedestrians and cyclists will be segregated.

2.3.7 Pedestrian and cycle shared space will also be included in the Phase 1 works on the east side of Riverside Drive up to the pedestrian crossing.

2.4 Cycling

2.4.1 Prior to the Phase 1 junction improvements, there were no segregated cycle provisions through the junction. A cyclist wishing to travel through the junction would have to interact with general vehicular traffic or dismount and utilise the remote crossings. A busy roundabout with high traffic volumes and multiple lanes and arms is unlikely to be suitable for most cycle abilities and even experienced cyclists may choose alternative routes to avoid such a junction. ACC's Cycle Map highlights "care needed" at the junction.

2.4.2 Shared use pedestrian and cycle paths are available along the riverside on North Esplanade West and Riverside Drive, however, cyclists are required to dismount on North Esplanade West on approach to the QE Bridge, due to a narrowing of the footway (See Figure 6).

2.4.3 Similarly, cyclists and pedestrians require to take care when routing under the Wellington Suspension Bridge, due to the narrow footways (Approx. 1-1.5m) – See Figure 7.

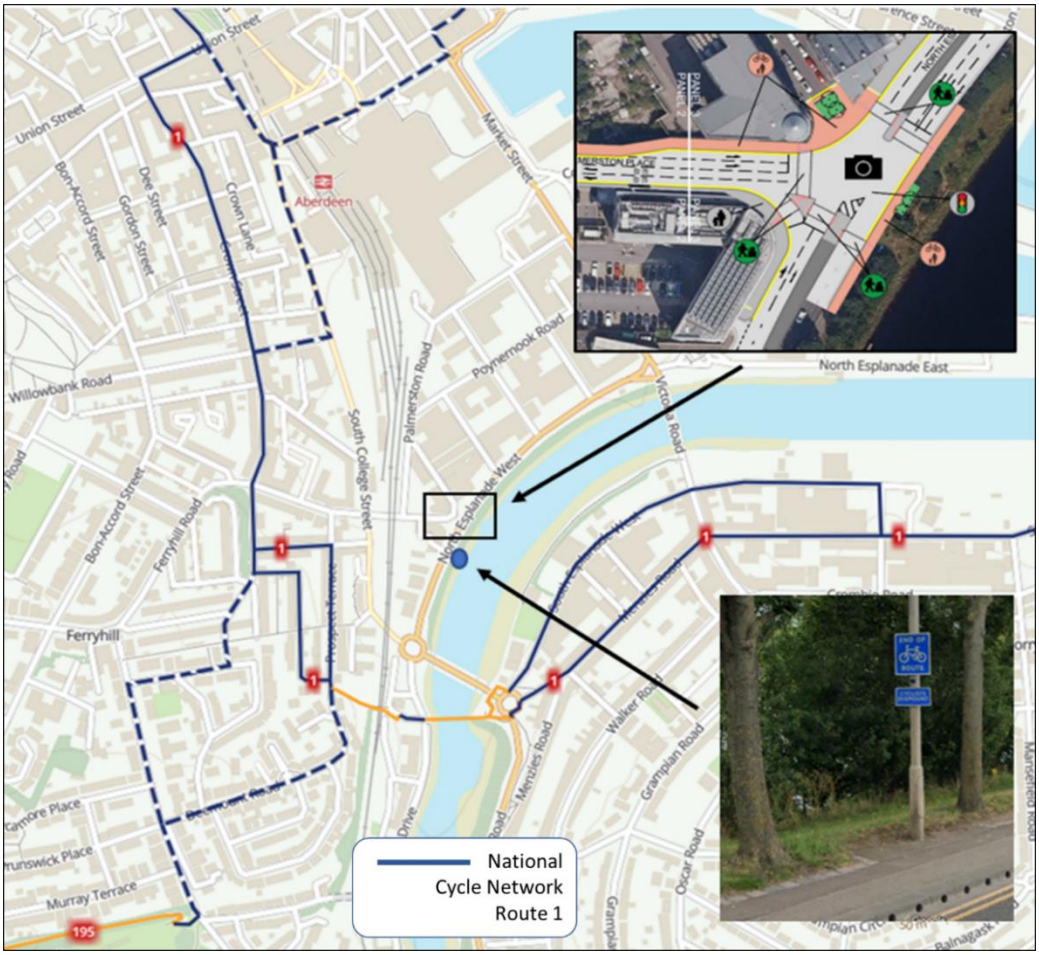


Figure 6. Disconnection for Cyclists on North Esplanade West

Figure 7. Narrow Footways Under Wellington Suspension Bridge (Source: © 2023 Google)

2.5 Public Transport

2.5.1 Currently there are no First Bus services that route through the Riverside Drive/South College Street/QE Bridge Roundabout. Citylink buses routing to and from the Bus Station do traverse the roundabout routing between South College Street and Wellington Road.

2.5.2 Future public transport routes through the junction may be required, including the proposed Aberdeen Rapid Transit (ART). The proposed ART connection to an interchange at Portlethen will either route via this junction or through Holburn Street and either King George VI Bridge or the Bridge of Dee. Detailed ART routing proposals have not been developed at the time of this report.

2.6 General Traffic

2.6.1 The junction is a four-arm roundabout in Aberdeen City Centre, connecting the key freight routes of A956 Wellington Road (via Queen Elizabeth II Bridge) with A956 North Esplanade West, and also the secondary routes of South College Street and Riverside Drive.

2.6.2 There is no signal control on any arm, but as noted above, two of the four arms have formal crossing points at the junction with a third formal crossing over 50m away from the junction.

2.6.3 Observed traffic survey data from 2019 is summarised in Table 1. The traffic data shows that there are high flows on all arms with QE Bridge and North Esplanade West carrying the highest traffic movements.

Table 1. 2019 Observed Traffic Survey Flows

12 Hr Directional Flows (07:00-19:00)					
From:	To:				
	QEII Bridge	N.E.W	South College St	Riverside Dr.	Total From:
QEII Bridge	9	4830	4471	755	**10065**
N.E.W	4900	310	516	3970	**9696**
South College St	3660	751	37	1600	**6048**
Riverside Dr.	887	3824	1684	3	**6398**
Total To:	**9456**	**9715**	**6708**	**6328**	**32207**

2.6.4 By 2022, Automatic Traffic Count (ATC) data shows that the traffic demand on Wellington Road is 20% lower than in 2019, due to the impact of COVID-19 on travel behaviour. The opening of the Palmerston Road link between South College Street and North Esplanade West will further change the traffic demands at the roundabout. Detail of the predicted changes to the junction traffic demands through traffic modelling are detailed in Chapter 5.

2.6.5 As noted, the A956 Wellington Road (via Queen Elizabeth II Bridge) and A956 North Esplanade West corridor serves as the signposted freight route through the city centre, as detailed in the Aberdeen Freight Map and shown in Figure 8, and provides access to and from Aberdeen Harbour.

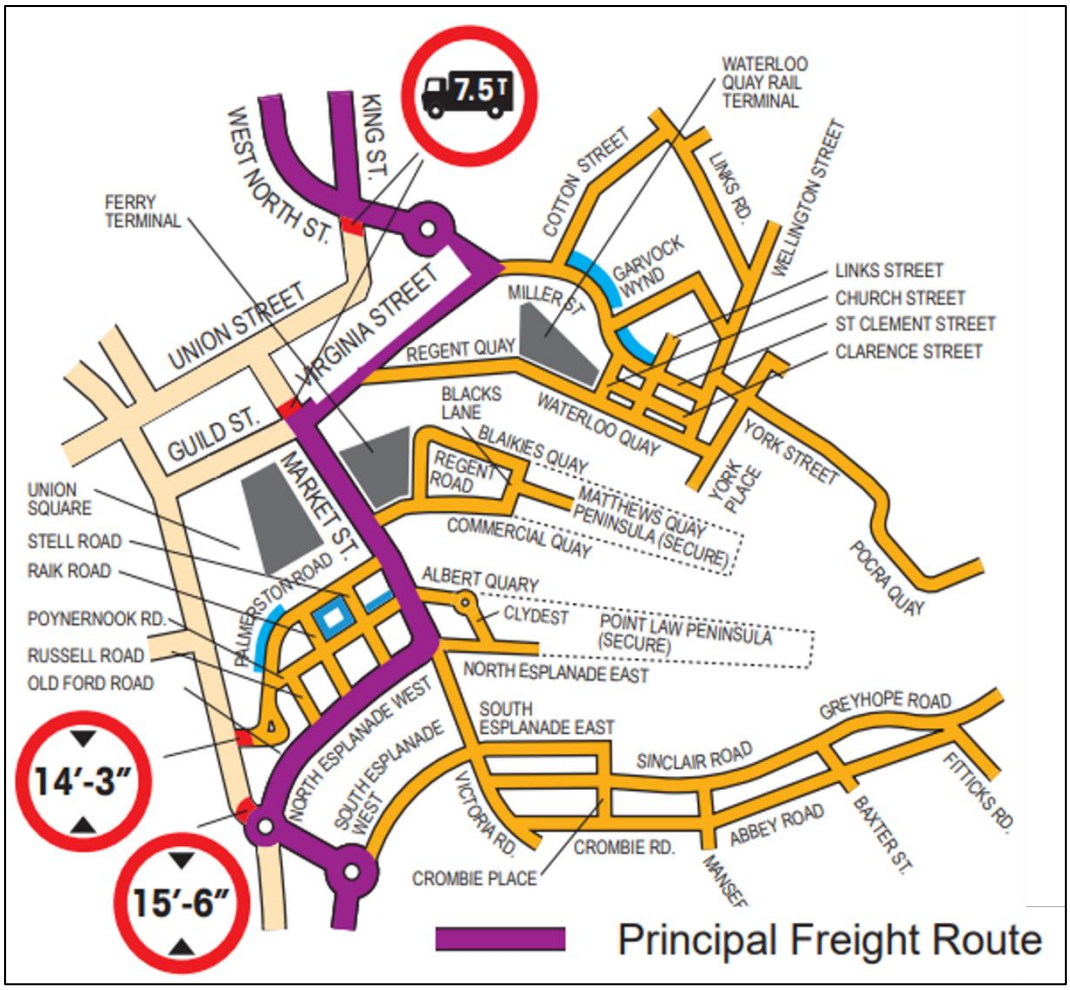


Figure 8. Aberdeen City Centre Freight Route

3. PROBLEMS, OPPORTUNITIES, ISSUES & CONSTRAINTS

3.1 Introduction

3.1.1 To inform the objective setting and option generation, the review of existing conditions has highlighted the following problems, opportunities, issues, and constraints

3.2 Problems

1. Cycle Route Disconnection

3.2.1 For cyclists, offline or segregated routes are available connecting Wellington Road (via Wellington Suspension Bridge) to Riverside Drive and South College Street. The enhanced cycle provisions on Riverside Drive and South College Street are included within Phase 1 of the South College Street improvements (See Figure 4)

3.2.2 There is a disconnection for cyclists from the shared footway along North Esplanade West. The cycle route along the south footway on North Esplanade West ends just south of the new junction connecting with Palmerston Place.

3.2.3 The lack of any formal cycle crossing provisions on South College Street or QE Bridge creates a disconnect for cyclists between North Esplanade West and all other arms of the junction – See Figure 9.

3.2.4 There are also no formal cycle crossing points at the southern junction of QE Bridge (with South Esplanade West & Wellington Road) to allow connection to the Wellington Suspension Bridge.

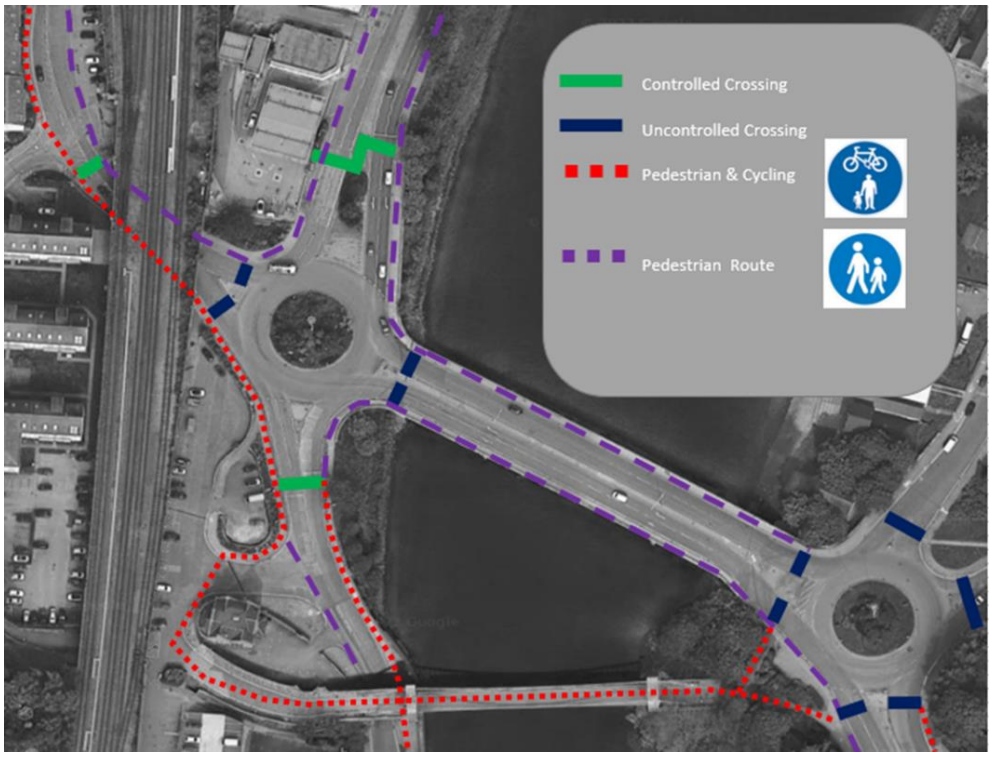


Figure 9. Cycle Route Disconnection

2. Lack of Controlled Crossing Provision for Pedestrians

3.2.5 The uncontrolled pedestrian crossing points on South College Street and QE Bridge are a potential safety issue given the high traffic volumes on all arms of the junction. The central reserve at each of these locations is very narrow and potentially unsuitable for those with prams/pushchairs or wheelchairs.

3.2.6 Whilst the Wellington suspension Bridge provides a separate pedestrian and cycle route over the River Dee, there are no controlled pedestrian crossing provisions on the south side of the River for safe access to the bridge from South Esplanade West, Craig Place, or the east side of Wellington Road.

3. High traffic demand on approach to the roundabout

3.2.7 All four arms of the junction carry a primary or secondary route function to and from the city centre area. Prior to COVID-19, high queueing and congestion was observed at this junction through the AM and PM peak hours.

4. No clear option for PT priority measures

3.2.8 The current roundabout design does not allow for future controlled bus priority measures. Physical constraints prevent consideration of additional bus lanes on approach to the junction. This may be problematic if considering an ART route through the junction.

3.3 Opportunities

1. Connection with Wellington Road Corridor

3.3.1 The Wellington Road corridor study includes proposals to enhance the northbound bus lane on Wellington Road and also to provide a segregated cycleway through the corridor – See Figure 10.

Figure 10. Wellington Road Corridor Study Proposals

3.3.2 Improvements to the South College Street / Riverside Drive junction will enhance the Wellington Road corridor study proposals by:

- Potentially providing controlled egress for public transport
- Provide safe pedestrian and cycle crossing facilities on all approaches
- Enhance and highlight the Wellington Suspension Bridge as a connected, safe and suitable crossing for pedestrians and cyclists.

3.4 Issues

1. Delivery of a junction design that benefits both active travel and general traffic

3.4.1 The study brief requires a junction design that shows '*demonstrable benefits for all modes'.* Any consideration of active travel improvements at the junction will generally impact on the capacity of the junction for general traffic. For example, a standard signalised junction will have approximately 20% less capacity than a roundabout.

3.4.2 The junction design will therefore require to consider active travel benefits whilst minimising the impact to the overall junction capacity.

2. Unclear longer term objectives for Public Transport

3.4.3 The longer term requirements for public transport through the junction are not explicitly clear. An ART route may potentially be required but alternative corridors are also under consideration.

3. Wider implications of turning movement restrictions

3.4.4 Any consideration to ban turning movements at the junction are likely to have implications on the wider corridor. The traffic modelling suite utilised for the assessment has very good network coverage on the north side of the River Dee, but is limited on the south side

3.5 Constraints

3.5.1 Due to the close proximity of the roundabout to the Railway line bridges and the QE Bridge there are numerous physical constraints around the study area.

3.5.2 Figure 11 shows road width constraints on South College Street and QE Bridge. The footway under the railway bridge on South College Street is currently being widened leaving a road width less than the 7.5m.

3.5.3 The QE Bridge itself is constructed from 2 separate beams with 7.5 m road widths in each direction. The central section of the bridge carries service cables etc and cannot be utilised for general traffic.

3.5.4 The footways on QE Bridge are 2m wide with a central refuse of 1m wide at the uncontrolled crossing point.

3.5.5 As shown in Figure 7, the road carriageway and footways under the Wellington Suspension Bridge are narrow, with the carriageway reduced to 5.5m wide, and the footways approximately 1m wide on the east side and 2m wide on the west.

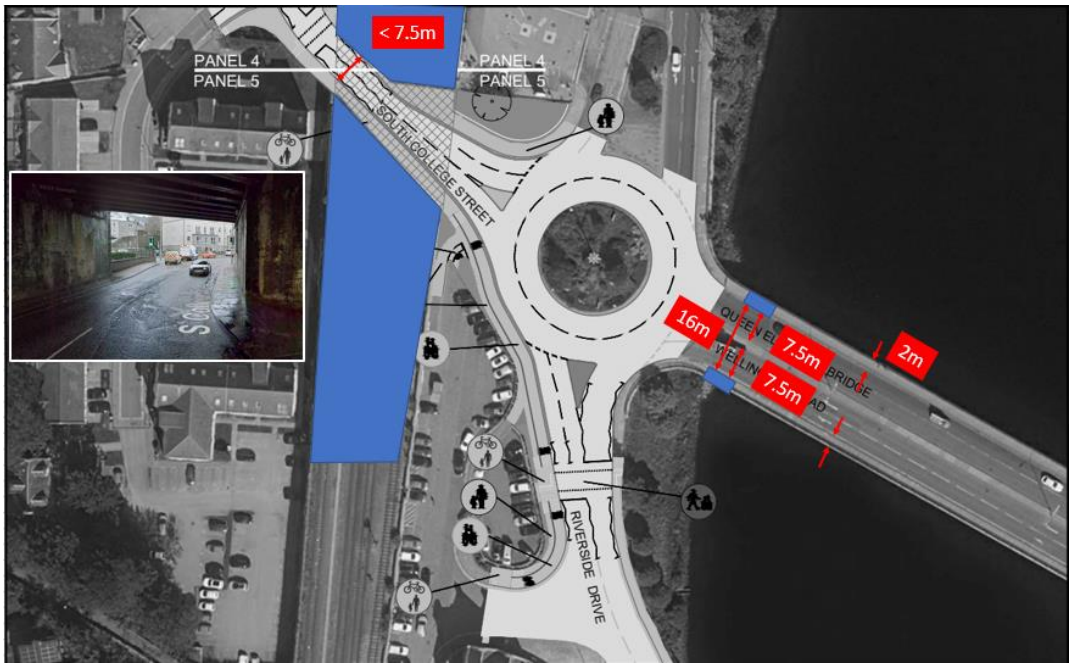


Figure 11. Physical Width Constraints within the study area

3.5.6 Figure 12 highlights the vertical constraints within the study area with height restrictions on Palmerston Place, South College Street and Riverside Drive. The 13'3'' height restriction on Riverside Drive therefore requires HGV's to be banned from this route.

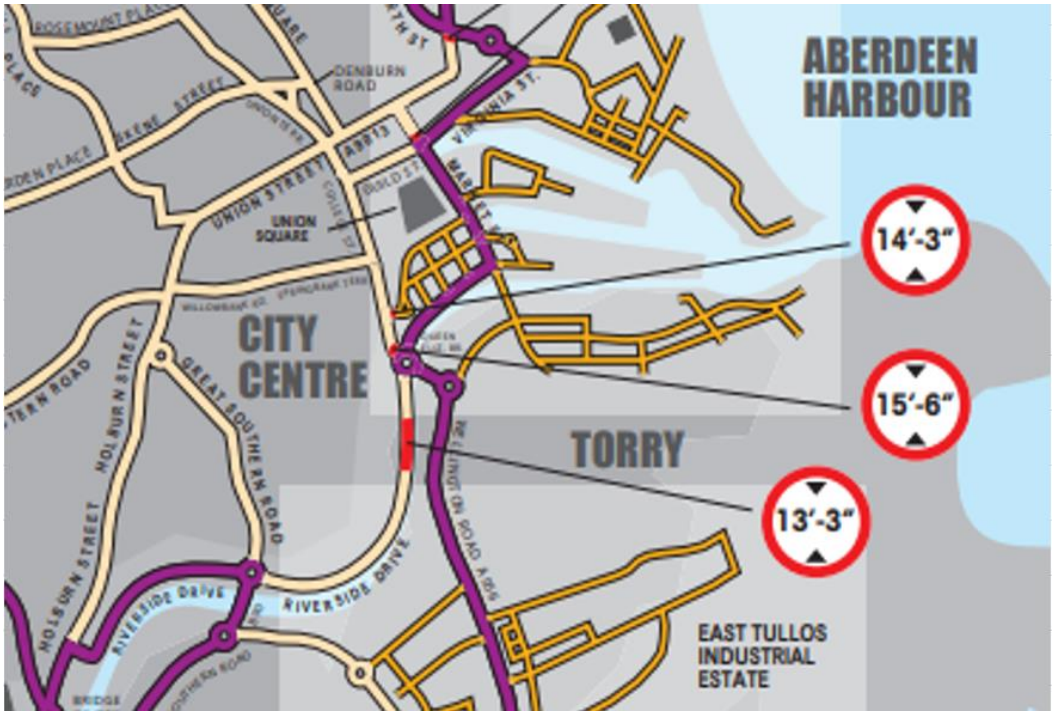


Figure 12. Physical Height Constraints within the Study Area

3.5.7 Figure 13 shows the location of the northern QE Bridge Deck, wing wall and parapet. Any requirement for a junction design option to widen or amend the road width such that the wing walls or parapet would require to be amended would incur significant construction costs.

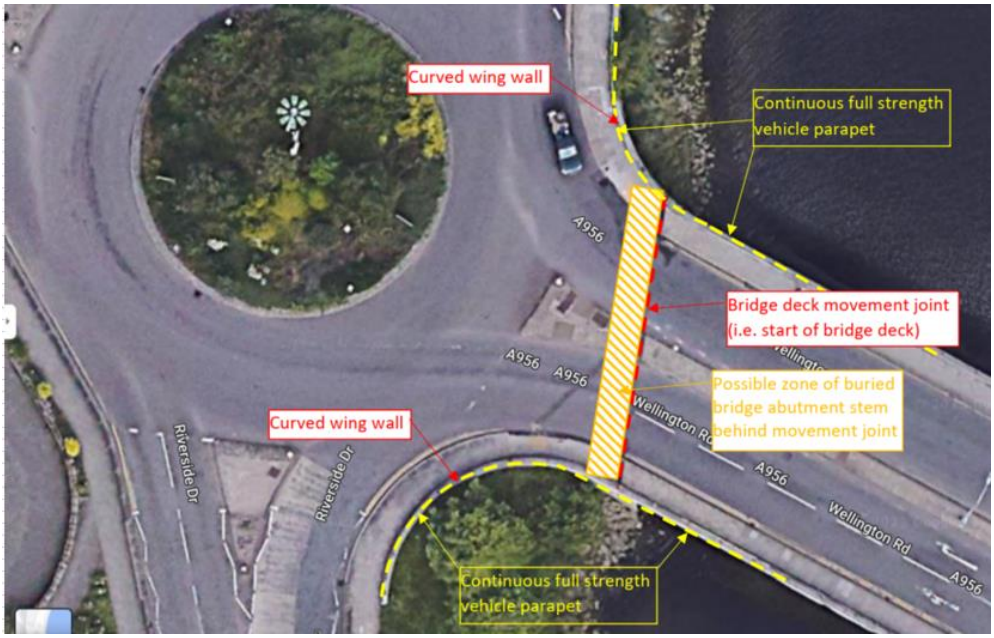


Figure 13. QE Bridge Constraints (Source Google Maps 2022)

3.5.8 The financial implications to overcome these physical constraints, including any revisions to bridge abutments etc, are anticipated to be significant and have not been considered as viable within the junction design optioneering.

3.6 Problems, Opportunities, Issues, Constraints Summary

3.6.1 A summary of the above noted problems, opportunities, issues and constraints is provided in Table 2.

Table 2. Problems, Opportunities, Issues & Constraints Summary

Problems	Opportunities	Issues	Constraints
• Safety Issue - Uncontrolled Pedestrian and cycle crossing on QEII Bridge and South College Street	• Connection with Wellington Road Corridor study to provide controlled egress for public transport	• Delivery of a junction design that benefits both active travel and general traffic	• Physical - Bridge abutment restrictions on South College Street under the railway bridge - only 2 lanes feasible
• Disconnect for cyclists to/from North Esplanade West	• Connection with Wellington Rd Corridor study to provide a connected cycle network from Wellington Road through to College Street and the city centre or to other routes through North Esplanade West and Riverside Drive	• Unknown requirement for public transport - Would an ART be able to route through South College Street through the study roundabout? . What level of PT provision is therefore required?	• Physical - Bridge Deck - 2 separate beams make up the construct of the Bridge - no opportunity to run additional lanes without significant costs
• High traffic demand on all four arms. Primary / Secondary Hierarchy route function	• Controlled pedestrian and cycle crossing on all arms of the junction will facilitate safer crossing connections for walking and cycle routes around the junction	• Any requirement to ban turning movements will have implications at other locations - particularly if restrictions affect River crossing traffic	• Bridge Height restrictions on Riverside Drive, South College Street and Palmerston Place
• Current junction design does not allow for any future controlled bus priority measures	• Opportunity to highlight the Wellington Suspension Bridge as a safe and suitable river crossing for pedestrians and cyclists	• Consideration of measures at the South Esplanade West / Wellington Road roundabout to provide a wider active travel connection is outwith the scope of this study	• Cost - any requirement to widen the QEII Bridge or the abutments of the Railway Bridge would have significant cost implications

4. OBJECTIVES

4.1 Introduction

4.1.1 The STAG-based assessment of the junction proposals require to be considered against a SMART set of objectives (specific, measurable, achievable, relevant and time-bound). The objectives were developed to address the requirements for the design to include 'benefits for all' but taking cognisance of the (NTS National Transport Strategy 2020) travel mode hierarchy as detailed in Figure 14.

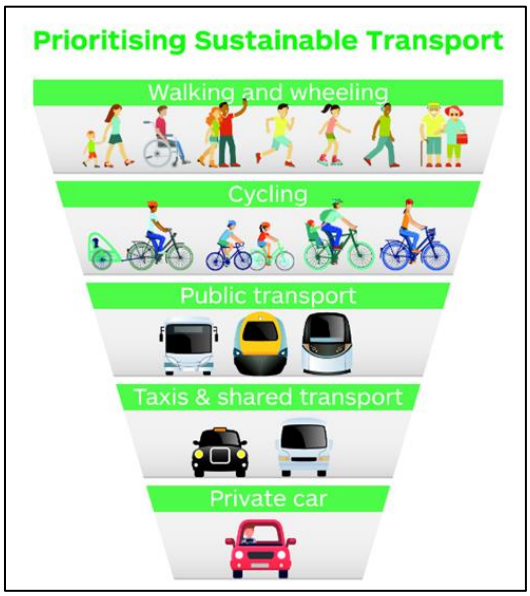


Figure 14. Prioritising Sustainable Transport (NTS)

4.1.2 Whist the South College Street junction study area falls slightly out-with the City Centre and Beach Masterplan boundaries, the objectives for these Masterplans must be considered within the objectives of this study in order for the junction itself to form part of the overarching transport strategy around the city centre.

4.1.3 The City Centre and Beach Masterplans set out a number of SMART (Specific Measurable Achievable Relevant Timely) objectives, and those considered relevant to this commission are:

- Increase ease of walking and cycling around Aberdeen
- Reduction in car journeys in the centre
- Creation of new public realm space leading to increased satisfaction with the city centre
- Reduction in city centre congestion
- Reduction in car journeys at the Beachfront

4.1.4 An initial set of draft objectives were circulated to ACC with feedback sought to further shape and agree on a final set of SMART objectives to be used in the appraisal.

4.1.5 The approved draft objectives were refined during the appraisal process for variations to the measure and method of analysis. This refinement is in line with the STAG principle of 'SMARTening' the study objectives through the appraisal process.

4.1.6 The STAG objective are provided in Table 3. Table 3 also provides the measure of option performance and the proposed method of analysis during the options appraisal.

Table 3. Study Objectives

Objective	Ref.	Measure	Method of Analysis
Improve Pedestrian, Wheeling, and cycling connectivity	1.1	Reduce Walk distances and travel time through the junction	A-B distance/time comparisons (Existing vs Option)
	1.2	Improve Cycle connections and travel time through the junction	A-B distance/time comparisons (Existing vs Option)
Ensure safe and equitable access for all	2	Increase controlled crossing points for all users	Comparison against existing provision
Maintain public transport connections	3.1	Futureproof designs to allow for potential PT priority measures	Assessment of Potential bus priority options
	3.2	Assessment of bus journey times through the junction	Existing vs Option (traffic model analysis)
Maintain freight connections through the junction	4.1	Assessment of key freight movements to and from the Harbour area	Assessment of HGV traverse through the junction
	4.2	Assessment of HGV journey times	Assessment of existing vs required provision. Existing vs Option (traffic model analysis)
Optimise the traffic network performance to facilitate the introduction of the City Centre Masterplan	5.1	Assessment of journey times	Existing vs Option (traffic model analysis)
	5.2	Assessment of queue lengths	Existing vs Option (traffic model analysis)
Network Resilience	6	Ability to cater for incidents, emergency vehicles	Review of Junction Design

5. TRAFFIC MODEL DEVELOPMENT

5.1 Introduction

5.1.1 In line with STAG, the Option Generation and Development processes requires a Do Minimum (or Reference Case) for assessment to be developed.

5.1.2 STAG states that options generated must be appraised against a Reference Case option that includes transport improvement commitments that have policy and funding approval. In addition, as yet uncommitted transport schemes and/or development profiles can be included as a baseline for option comparison.

5.1.3 Therefore, as part of the assessment of potential options at the junction, a Reference Case scenario was defined and is the baseline against which options are appraised. The first step in defining the Reference Case was to create appropriate forecast traffic models.

5.2 Traffic Model Network Development

5.2.1 The traffic modelling for this commission has been undertaken using the Aberdeen City Centre Paramics 2019 microsimulation model (ACCPM19) as a starting point. This has been supported by the strategic ASAM19 model, which incorporates the strategic impact of the future wider developments, infrastructure and policy. Using both the ACCPM19 and ASAM19 models, a 2025 future year scenario has been developed from which the Reference Case for assessment is defined.

5.2.2 The network description for the ACCPM19 is shown in Figure 15

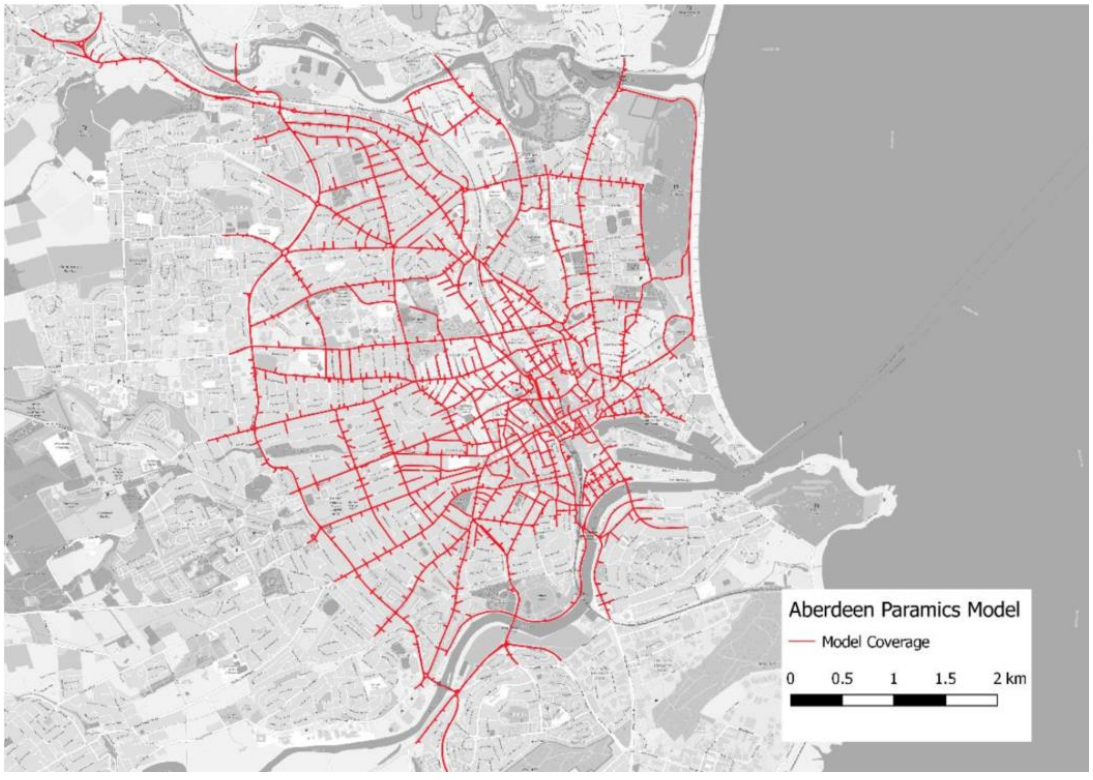


Figure 15. ACCPM19 Model Network Description

5.2.3 ASAM19 was utilised to assign background growth to the forecast year 2025 and incorporates the influence of future strategic infrastructure and development changes. The ASAM19 2025 future year scenario includes:

- Aberdeen City Centre Masterplan – Key City Centre Restrictions
- Aberdeen City Centre Low Emission Zone
- Bus Partnership Fund Studies:
  - Bus Alliance Priority Corridors:
    - A944 Westhill to Aberdeen City Centre
    - Ellon to Garthdee via Aberdeen City Centre
    - Inverurie to Aberdeen City Centre
    - Stonehaven to Aberdeen City Centre
  - Aberdeen Rapid Transit
- Bridge of Don to City Centre Active Travel Study
- Wellington Road Multi Modal Transport Study
- The updated Aberdeen Roads Hierarchy (currently included in the CCMP modelling)

5.2.4 These schemes were included in ASAM19 through the same methodology derived for the initial Beach Development Framework ASAM14 testing as agreed with ACC in April 2022. Full details of how each scheme has been represented is provided in the report *Aberdeen Beach Development Framework, Transport Element (SYSTRA Ref. GB01T22A27/3, April 2022)*.

5.2.5 The 2025 Reference Case Paramics model includes the following infrastructure:

- South College Street – Phase 1 (currently under construction)
- Low Emission Zone (LEZ) - live now but fully enforced in 2024
- Berryden Corridor Improvements – Due to open 2024/2025
- City Centre Masterplan: ETRO-2 - Due to open in Summer 2023, including:
  - General traffic restrictions through Bridge St, Guild St, Market St
  - General traffic restriction from Union Terrace to Rosemount Viaduct
- Union Street Central – Streetscape measures – assume no change to the model network for the purposes of this model scenario

5.3 Traffic Demand Development

5.3.1 ASAM19 has been developed with two future scenarios, summarised as follows:

- "With Policy" – Reflects the 2030 target for reducing vehicle car kilometres by 20%
- "Without Policy" – Only included some post Covid-19 travel behaviour changes

5.3.2 More information on the application of the 'with' and 'without' policy future scenarios for development and infrastructure assessment is detailed in the Information Note: '*Addressing Uncertainty in Traffic Model Assessments – Aberdeen Case Study' (Ref: GB01T21D88/0423, April 2023)*

5.3.3 ASAM19 has developed forecasts for 2025 through to 2045 and the forecast changes to Road Trips from the ASAM19 Base (2019) for both with and without policy are shown in Figure 16.

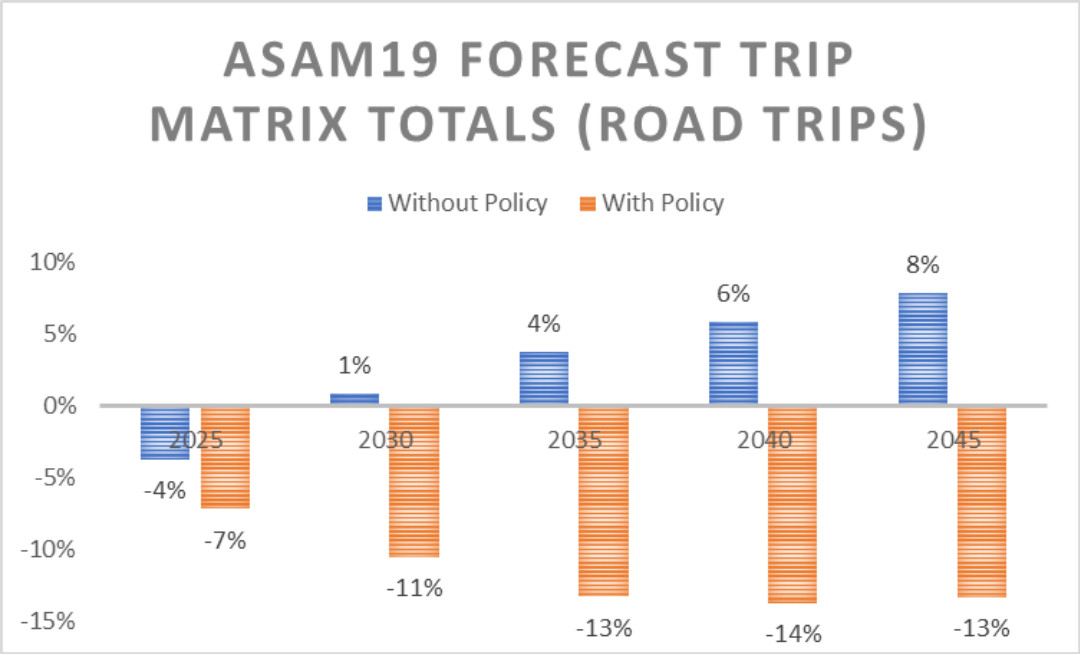


Figure 16. ASAM19 Forecast Summary

5.3.4 Figure 16 shows that in 2025, road trips are forecast to reduce in both the "with policy" (7% reduction) and "without policy" (4% reduction) scenarios.

5.3.5 ASAM19 2025 cordon matrices were applied to the ACCPM19 to create a 2025 Do-Minimum Paramics traffic model in which local junction improvement options for the South College Street junction could be modelled and assessed.

5.3.6 Table 4 summarises the subsequent trip matrix changes from the global ASAM through the ASAM cordon area (to the boundary of the ACCPM19), to the City Centre Paramics Model ACCPM19.

Table 4. ASAM / Paramics Model Trip Matrix Correlation

	Difference to 2019 Base			
Scenario	AM	IP	PM	TOTAL
ASAM Global With Policy	-10%	-3%	-8%	-7%
ASAM Global Without Policy	-5%	-1%	-4%	-4%
ASAM Cordon with Policy	-10%	-4%	-8%	-8%
ASAM Cordon without Policy	-6%	-2%	-5%	-5%
Paramics Model - With Policy	-13%	-1%	-9%	-6%
Paramics Model - Without Policy	-6%	2%	-5%	-2%

5.3.7 The above table shows that the overall traffic demand changes in the ACCPM19 are reflective of the predicted traffic demand changes in the ASAM network.

Comparison with Observed Data

5.3.8 Due to the ongoing construction works for Phase 1 at the time of this study, new traffic surveys were not possible. However, analysis of Automatic Traffic Count (ATC) data for Wellington Road was undertaken to provide an indication of the changes to traffic demand through this corridor following the COVID-19 pandemic.

5.3.9 Figure 17 shows that there was approximately 20% reduction in traffic routing northbound and southbound through Wellington Road between 2019 and 2022.

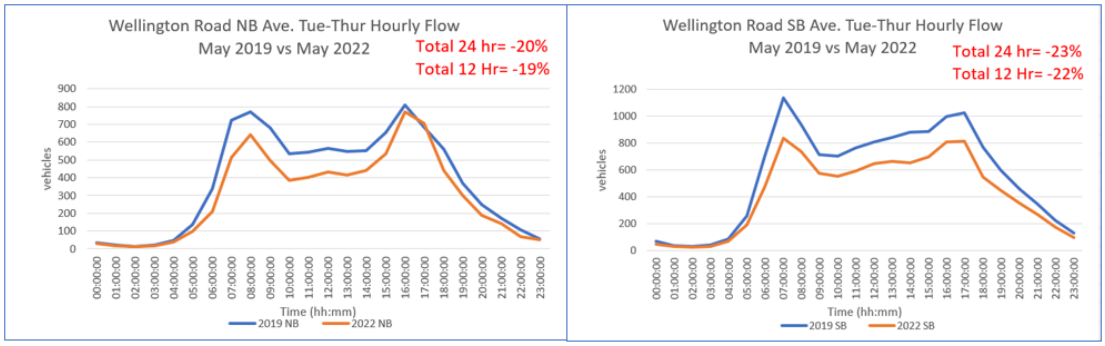


Figure 17. Wellington Road ATC data

5.3.10 Analysis of the 2025 'with' and 'without' policy microsimulation model scenarios showed that the 2025 'with policy' model network had very similar traffic demand changes on Wellington Road since 2019 compared to the 2022 observed data – See Table 5.

Table 5. Observed Vs Model Traffic Demand Comparison – Wellington Rd

Scenario	NB	SB	Two-Way
ATC Diff 2019- 2022	-19%	-22%	-21%
Ref Case 2025 (WP)	-23.5%	-16.9%	-20.1%
Ref Case 2025 (WOP)	-20.2%	-15.0%	-17.5%

5.3.11 Table 5 therefore suggests that the 2025 Reference Case Models are relatively aligned with the significant traffic demand changes that have occurred since 2019. In fact, the 'with policy' scenario is very closely aligned with the 2022 model network traffic patterns.

5.3.12 This comparison was also undertaken in a parallel study relating to the A956 / Beach Boulevard junction. Traffic survey data collated in 2022 correlated closely to the 2025 with policy scenario.

5.3.13 It was therefore decided that, for both studies, the 2025 with-policy scenario would form the key model testing scenario from which to undertake the appraisal of junction improvement options.

5.3.14 Further model analysis of both the 'with' and 'without' policy scenarios, actually showed very little difference in traffic flow, queue levels, and journey times through the study junction, therefore:

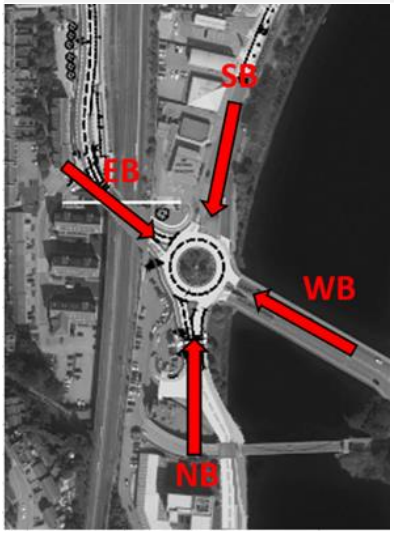
> All options that progress to modelling will be assessed under the "With Policy" scenario, with cognisance taken of both with and without policy scenario during the final assessment.

5.4 South College Street Junction Demand

5.4.1 Following the development of the 2025 Reference Case scenario, analysis of the predicted traffic demand changes at the South College Street junction is summarised in Table 6.

Table 6. South College Street Junction – Modelled Traffic Demand Changes 2019-2025

12 Hr Directional Flows (07:00-19:00)							
Scenario	NB	SB	EB	WB	Total	% Diff	Comment
Obs 2019	6398	9517	6047	10066	32028	-	
Base 2019	6868	10044	5403	9689	32004	**-0.1%**	
Ref Case 2022 (WP)	7068	9371	5130	7897	29466	**-7.9%**	Including Impact of COVID, Central Union St & Schoolhill Restrictions
Ref Case 2025 (WP)	7801	7749	4418	7999	27967	**-12.6%**	Additional Traffic demand from CCMP, but inclusion of Palmerston Link Road
Ref Case 2025 (WOP)	7879	7976	4547	8305	28707	**-10.3%**	Similar to WP scenario



5.4.2 The Ref Case 2022(WP) network scenario includes the same trip matrices as the Ref Case 2025(WP). The difference between them being the physical infrastructure changes related to the City Centre Masterplan traffic restrictions (anticipated to open in 2023) and also the inclusion of the South College Street Phase 1 measures including the Palmerston Road link road (anticipated to open in Summer 2023), .

5.4.3 The Ref Case 2022 shows an 8% reduction in traffic demand (over 12 hrs) from the 2019 baseline, primarily due to the impact of COVID-19. Between 2022 and 2025 the further physical network changes detailed above have conflicting impacts on the traffic demand at the junction.

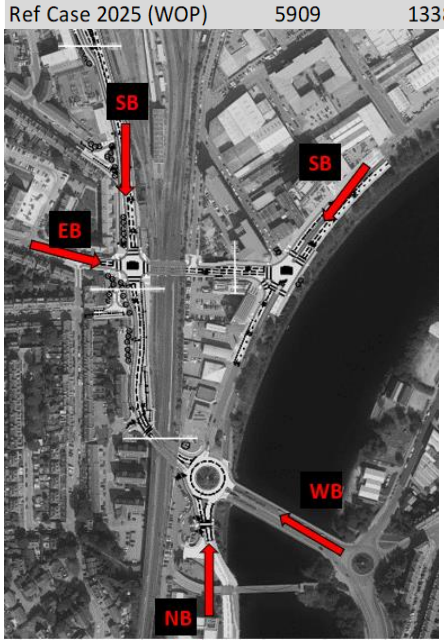
5.4.4 The City Centre Masterplan includes traffic restrictions through Union Street, Schoolhill and Guild Street. These restrictions on the east-west corridors through the city centre are anticipated to displace traffic out-with the core city centre area and result in additional traffic demand through the South College Street junction.

5.4.5 The South College Street Phase 1 measures, specifically the Palmerston Place link road, is designed to accommodate a proportion of the traffic displaced from the city centre.

5.4.6 The junction traffic demand figures presented in Table 6 therefore do not provide the full impact of the changes at wider South College Street 'triangle' of junctions. If the traffic demand assessment is considered wider, and inclusive of the Palmerston Place link road, there is a clearer understanding of the traffic demand changes in 2025. This is shown in Table 7.

Table 7. South College Street Area – Modelled Traffic Demand Changes 2019-2025

	12 Hr Directional Flows (07:00-19:00)						
Scenario	Sth College St SB	N.E.W SB	QEII Bridge WB	Riverside Dr NB	Milburn St EB	Total	% Diff
Base 2019 (v25)	5221	10056	9689	6868	2189	**34023**	-
Ref Case 2025 (WP)	5771	12938	8025	7776	3123	**37633**	11%
Ref Case 2025 (WOP)	5909	13381	8320	7890	3190	**38690**	14%



5.4.7 Table 7 shows the traffic flows assessment through the wider 'triangle' of junctions (including the junctions at either end of Palmerston Road). The model flow data suggests that there is at least a 10% increase in traffic demand through the area compared to the 2019 baseline. This can be attributed primarily to the impact of the city centre masterplan road restrictions, but also to a lesser extent the Low Emission Zone.

5.4.8 The impact of the Palmerston Place link road is therefore significant as the increase in traffic demand through this area does not result in an increase at the South College Street roundabout itself. Instead there is a net reduction in demand as detailed in Table 6.

5.4.9 The Palmerston Place link road therefore performs the function it was designed for, which is to remove some of the additional traffic demand from the QE Bridge roundabout itself. The impact of the Palmerston Place link road is shown in Table 8, which details the traffic flow levels through the Palmerston Place link road compared to the overall wider junction traffic demand identified in Table 7.

Table 8. Palmerston Road Traffic Flows – 2025 Ref Case

Scenario	Palmerston Rd EB	Palmerston Rd WB	Total	% of Wider Junction
Ref Case 2025 (WP)	1849	6510	8359	22%
Ref Case 2025 (WOP)	1898	6674	8572	22%

5.4.10 For the development of South College Street / Riverside Drive junction design options, it is therefore important to note that the overall traffic demand levels in 2025 are anticipated to be approximately 10% lower than the 2019 baseline levels.

6. OPTION GENERATION AND INITIAL SIFTING

6.1 Introduction

6.1.1 The purpose of the option generation, initial appraisal, and sifting process is to derive a 'Long List' of options that could satisfy the study's objectives, alleviate the identified problems and address the outlined opportunities. The options should then be subject to a further appraisal process as part of the 'Option Development' (Chapter 8) to better align with the objectives.

6.1.2 In line with STAG, the options for this 'Long List' were generated through a number of methods, including:

- Consideration of previous studies – various traffic modelling studies dating back to 2017
- Consideration of existing conditions (problems and opportunities)
- Analysis of the existing transport network and committed measures
- Current design standards and guidelines
- Professional judgement flowing from a structured decision making process by the study team.

6.1.3 The problems and opportunities review identified that there are physical constraints around the junction that limit the opportunity to create additional junction capacity to offset the active travel improvement requirements.

6.1.4 At an early stage of option development, it was considered critical to consider the potential impact on the junction capacity for any option developed. A desktop assessment of each option was undertaken to assess the potential junction capacity (using traffic signal design first principles). This review helped to sift out options at an early stage.

6.1.5 From previous studies, it was found that a key methodology to improve the junction capacity whilst improving active travel provisions at the junction was to simplify signal phasing. This requires the removal or banning of certain traffic movements through the junction. Key traffic movements relating to the freight route however, would require to remain.

6.1.6 Although the 2017 Committee Members approved the principle of a traffic signal junction at this location, ACC requested that SYSTRA also consider the retention or re-design of a roundabout operation at this location.

6.1.7 For the development of active travel improvements, the key design changes required at the junction have been identified and detailed in Chapter 4. This commission does not develop options to detailed design but it is important that cognisance is taken of relevant design policy and guidance such as Cycling by Design, Roads for All and Designing Streets from the Option Generation stage right through to identification of the final preferred option.

6.2 Option Generation & Sifting

6.2.1 Development of options based upon the above, and combining them with further options utilising the methods outlined in STAG, identified 9 options to be considered for initial sifting.

6.2.2 For each option, an approximate sketch was made (See Appendix A) and key pedestrian, wheeling, cycling and vehicular movements identified. Each option was then scored against the identified study objectives on a simple positive (+), neutral(/) and negative(-) scale.

6.2.3 Scenario Test 1a and 1b considered the potential for an all-round signalled controlled crossing. Scenario 1a allowed all traffic movements and an all round pedestrian crossing phase, whilst 1b included a banned right turn on the Riverside Drive and North Esplanade West approaches to the junction.

6.2.4 Scenario 2 also considered a signalised junction, but each arm operating on a walk-with operation to remove the requirement for an all-round pedestrian crossing phase.

6.2.5 Scenario 3 considered a hybrid of walk-with crossings on some arms of the junction, with remote crossings on the others. Three variations of this approach were considered (3a, 3b, and 3c)

- Scenario 3a includes walk-with crossings on 3 arms of the junction with a remote crossing on North Esplanade West.
- Scenario 3b has the same crossing provisions but includes the banned right turns on Riverside Drive and North Esplanade West
- Scenario 3c includes a walk-with crossing on QE Bridge with all other arms of the junction operating with remote pedestrian crossings.

6.2.6 Scenario 4 considered the retention of a roundabout in some form.

- Scenario 4a includes the retention of the existing roundabout with the inclusion of a remote pedestrian crossing on QE Bridge, back from the junction itself.
- Scenario 4b includes the realignment of the roundabout eastward to allow a Toucan crossing to be located across QE Bridge without the requirement to widen the bridge abutments.
- Scenario 4b includes the further re-alignment of the roundabout to the east to facilitate a Toucan crossing on QE Bridge. In order to accommodate the roundabout within the available space, a spiral operation for the roundabout was considered.

Table 9 details the option scenarios assessed initially at a high level against the study objectives on a simple positive (+), neutral(/) and negative(-) scale.

Table 9. Option Long List and initial Sifting Outcome

General Concept	Scenario	Pedestrian Provision	Signal Detail	Additional Detail	Objectives 1	2	3	4	5	Progress
South College Street Phase 1:	Ref Case (2025)	2 Remote controlled crossings	Priority Roundabout Retained	-						
Junction Signalisation All round Ped Crossing	**1a**	All-round controlled crossing	5 stage signals	All movements permitted	+	+	+	+	+	**Yes**
	1b	All-round controlled crossing	4 stage signals	Banned R/T on Riverside Dr & N.E.W.	+	+	+	+	+	**Yes**
Junction Signalisation - Walk with crossing	**2**	Walk-with crossing required for each arm	4 stage signals	All movements permitted	+	+	+	+	+	**Yes**
Junction Signalisation - Walk with crossing Selected Remote Peds	**3a**	Walk-with crossing required for 3 arms (remote on N.E.W.)	4 stage signals	All movements permitted	+	+	+	+	+	**Yes**
	3b	Walk-with crossing required for 3 arms (remote on N.E.W.)	3 stage signals	Banned R/T on Riverside Dr & N.E.W.	+	+	+	+	+	**Yes**
	3c	Walk-with crossing required for 1 arms (QEII Bridge) All others remote peds	4 stage signals	All movements permitted	+	+	+	+	+	**Yes**
Retain Roundabout	**4a**	Additional Remote Ped crossing on QEII Bridge (peds only)	-	Crossing at least 20m from junction	+	+	/	+	+	**Yes**
	4b	Additional Remote Ped crossing on QEII Bridge (Toucan)	-	Crossing min Distance from Junction	+	+	/	+	+	**Yes**
	4c	As per Test 4b but with revised roundabout location	-	Riverside Drive lane allocation change required	+	+	/	+	+	**Yes**

6.2.7 From the above tables, all options were considered to have met the initial study objectives at a high-level consideration. Only the roundabout options (4a, 4b & 4c) were considered to not be able to provide additional benefits for public transport connections. This however, did not rule them out from further appraisal as they could at least maintain the current level of provision.

6.2.8 The next stage of sifting was to consider the impact that junction scenarios would have on the operational capacity of the junction. This would identify if the options were feasible for further consideration.

6.2.9 Utilising modelled flows from the 2025 Reference Case model, AM (08:00-09:00) and PM (17:00-18:00) peak hour turning movement counts were derived for the junction. From these, initial traffic signal stage diagrams and phase (movement) timings were derived for each signalised junction.

6.2.10 The outcomes from operational capacity and design feasibility assessment of the 6 signalised junction options is shown in Table 10.

6.2.11 As part of the feasibility assessment, the geometric requirements for the roundabout options were assessed at a high level and a review of the potential requirements for these options on QE Bridge were discussed with SYSTRA bridge engineers.

Table 10. Initial Feasibility Assessment

General Concept	Scenario	Pedestrian Provision	Feasibility	Junction Capacity AM Pk	Junction Capacity PM Pk	Taken Forward for detailed modelling
Junction Signalisation All round Ped Crossing	**1a**	All-round controlled crossing	+	100%	120%	x
	1b	All-round controlled crossing	+	95%	111%	x
Junction Signalisation - Walk with crossing	**2**	Walk-with crossing required for each arm	+	123%	136%	x
Junction Signalisation - Walk with crossing Selected Remote Peds	**3a**	Walk-with crossing required for 3 arms (remote on N.E.W.)	+	111%	113%	x
	3b	Walk-with crossing required for 3 arms (remote on N.E.W.)	+	100%	102%	✓
	3c	Walk-with crossing required for 1 arms (QEII Bridge) All others remote peds	+	85%	103%	✓
Retain Roundabout	**4a**	Additional Remote Ped crossing on QEII Bridge (peds only)	+	-	-	✓
	4b	Additional Remote Ped crossing on QEII Bridge (Toucan)	/	-	-	x
	4c	As per Test 4b but with revised roundabout location	+	-	-	✓

6.2.12 Table 10 shows that many of the signalised junction option scenarios were predicted to be significantly over capacity at modelled peak hour anticipated traffic volumes. Only Scenario 3b and 3c showed potential to be able to accommodate the predicted traffic demand whilst providing additional pedestrian and cycle crossing facilities at the junction.

6.2.13 Following discussion with the ACC study team, the agreed outcome from this initial feasibility assessment was that Options 3b and 3c should be taken forward to modelling and appraisal.

6.2.14 In addition, the ACC study team identified that Option 4c would be more likely to be able to be accommodated within the junction geometry compared to Option 4b. Therefore Option 4a and 4c should also be taken forward to detailed appraisal.

Protected Controlled Junction Layout

6.2.15 Cycling by Design (2021) promotes the concept of protected junctions for pedestrians and cyclists, similar to that detailed in Figure 18. There are variations on the design considered within Cycling by Design, including full signal controlled layouts, Zebra crossings of the cycle track, and CYCLOPS layouts. Within each of these scenarios pedestrian and cycle crossing facilities are included within the junction through either an all round pedestrian & cycle phase or a walk-with phase.

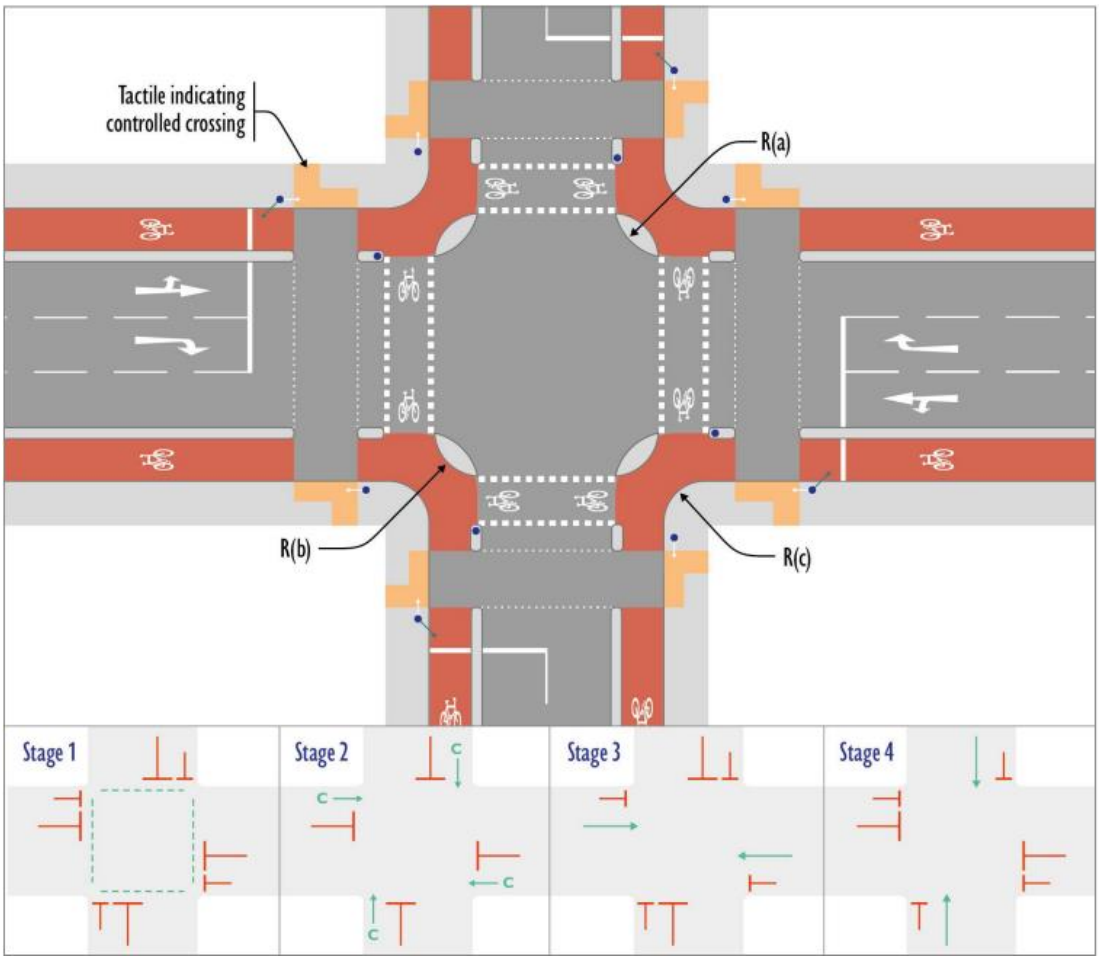


Figure 18. Example of a Protected Junction (Cycling by Design 2021)

6.2.16 From the model testing detailed in Table 10, Scenarios 1 and 2 represent the operation of a standard protected controlled junction. These model tests showed that the junction was over capacity when all pedestrian and cycle movements were permitted at the junction. A junction design solution would therefore need to deviate from those explicitly detailed in Cycling by Design.

7. OPTION DEVELOPMENT

7.1 Introduction

7.1.1 The four junction design options remaining from the option generation and initial sifting process were carried forward for further development, traffic modelling and appraisal.

7.1.2 The first step in this stage of the assessment was to further develop the option designs using AutoCAD design software to allow for an initial high level engineering design review. Through the traffic modelling process, an iterative review and amendment of the design detail was then undertaken.

7.1.3 The four options were renumbered to simplify the remainder of the appraisal process, as set out in Table 11. The concept design drawings are shown in the following section with further detail on each option provided.

7.2 Options Progressed to Modelling & Appraisal

Table 11. Junction Design Options for Modelling & Appraisal

Option	Option Concept	Option Detail Summary
Option 1	Roundabout	Retention of existing roundabout with remote staggered Pedestrian crossing on QEII Bridge approximately 20m from the junction
Option 2	Roundabout	Re-alignment of the roundabout eastwards to allow for the implementation of a remote staggered pedestrian crossing on QEII Bridge.
Option 3	Signalised junction	All turning movements permitted. Walk-with staggered Toucan crossing on QEII Bridge and staggered pedestrian crossing on South College Street. Retention of existing remote crossings on Riverside Drive and North Esplanade West
Option 4	Signalised junction	Banned Right Turn movements on North Esplanade West and Riverside Drive. Walk-with staggered Toucan crossing on QEII Bridge and staggered pedestrian crossing on South College Street. Retention of existing remote crossings on Riverside Drive and North Esplanade West

Option 1

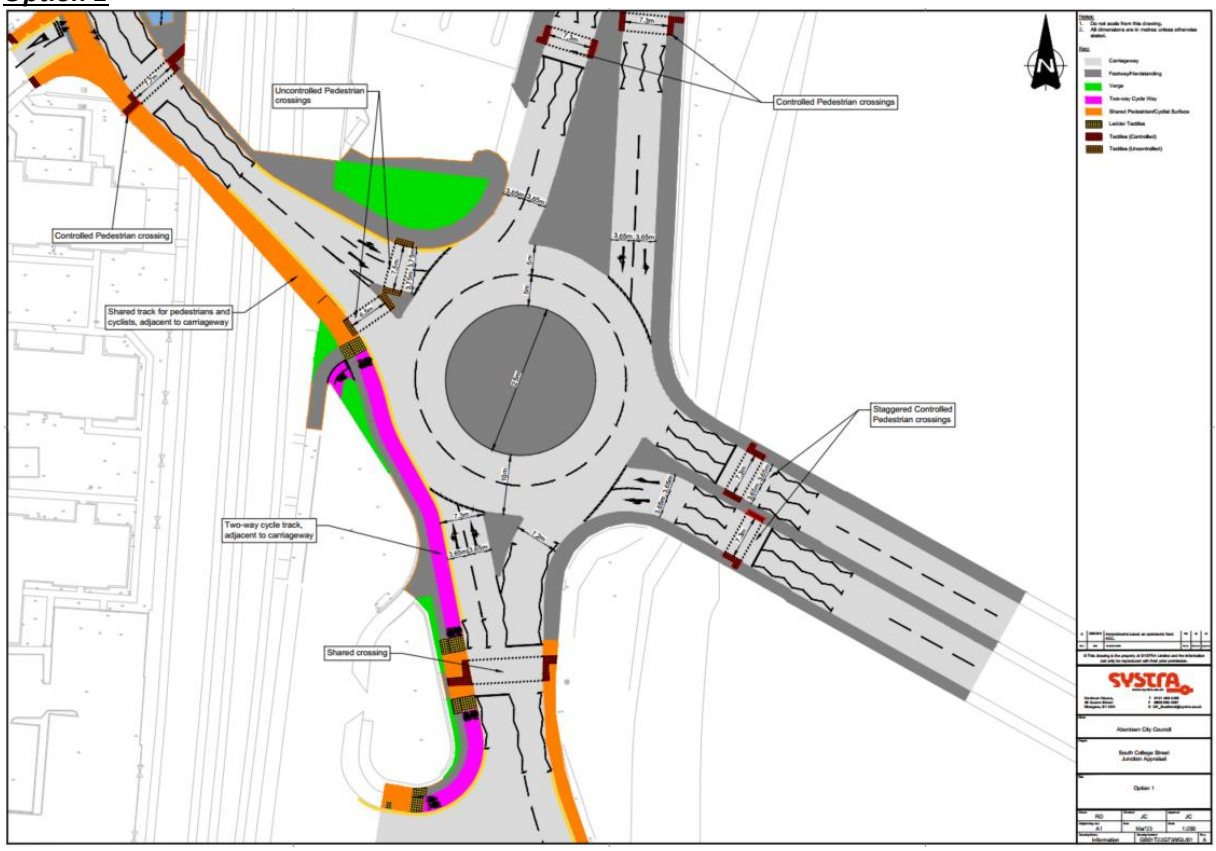


Figure 19. Option 1 Concept Design

- Low Cost Option
- Remote crossing on QE Bridge for pedestrians. Cyclists requiring to access North Esplanade West would require to either dismount or route via South College Street and Palmerston Place (See Figure 20 below).
- The remote crossings on Riverside Drive and North Esplanade West would remain
- The uncontrolled crossing at the south end of South College Street would either remain (or barriers put in place to prevent crossing at this location)

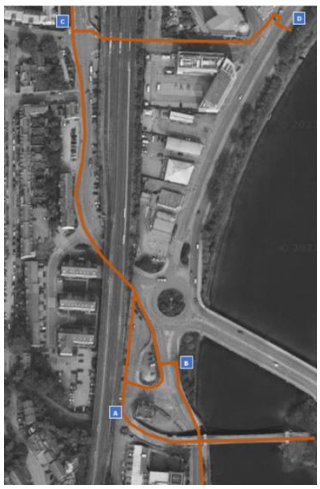


Figure 20. Option 1 Cycle Path Routing

Option 2

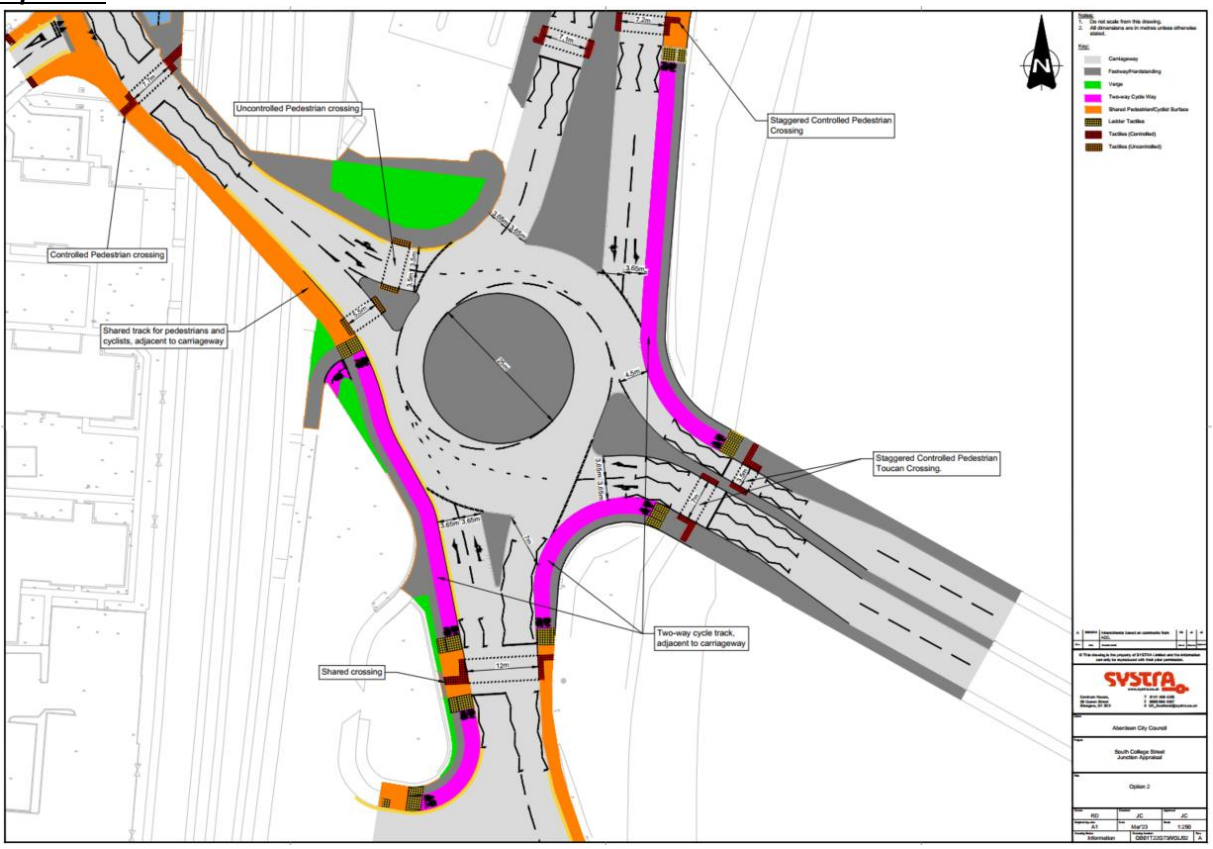


Figure 21. Option 2 Concept Design

- Re-alignment of roundabout to accommodate a remote Toucan crossing at the junction with QE Bridge to avoid engineering requirements to amend the bridge abutments.
- The remote crossings on Riverside Drive and North Esplanade West would remain
- The uncontrolled crossing at the south end of South College Street would either remain (or barriers put in place to prevent crossing at this location)
- A spiral roundabout design would require only 1 circulating lane on the east and west side of the roundabout. This would help facilitate the proposed Toucan crossing at QE Bridge.
- The Southbound movement across the Bridge would only be delivered in 1 lane initially before widening to two lanes across the Bridge. The current roundabout operation also only delivers traffic to the Bridge SB from 1 lane from all directions.

Option 3

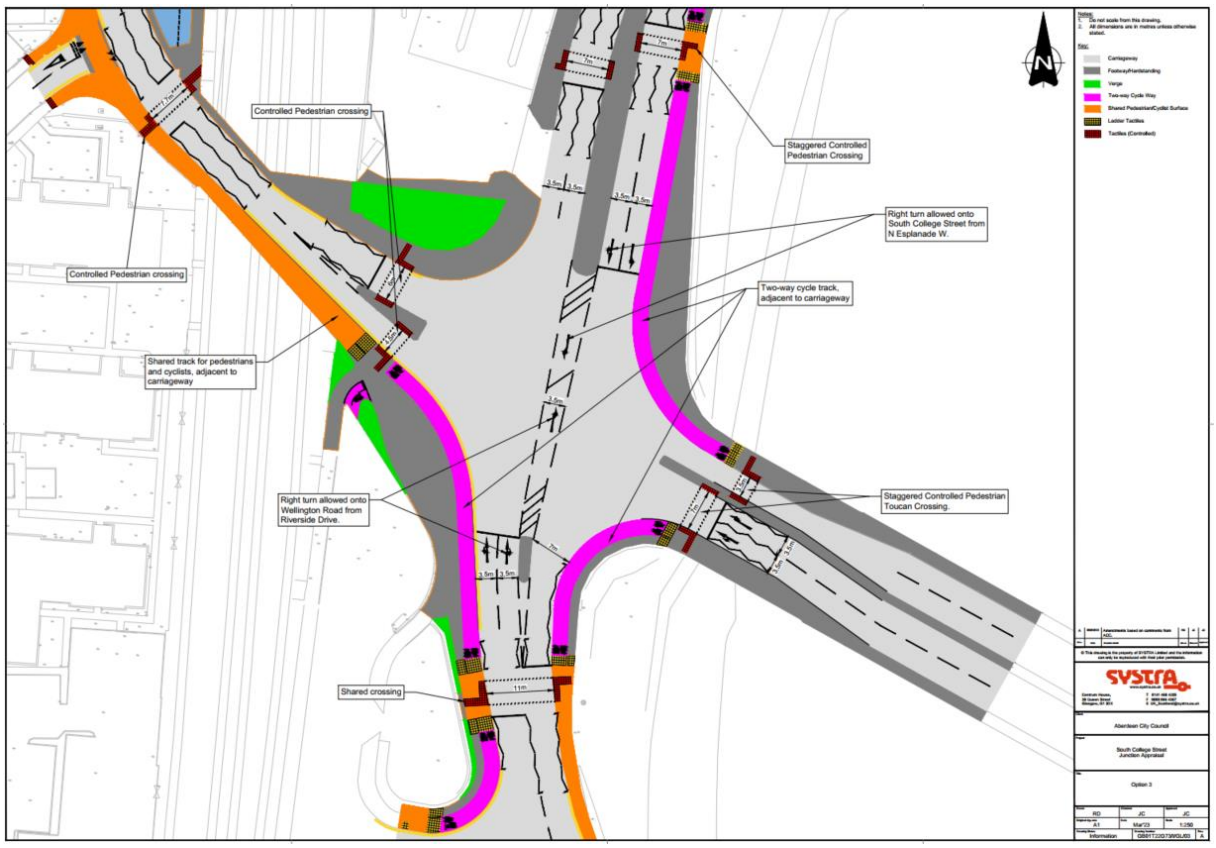


Figure 22. Option 3 Concept Design

- Signalised junction with all turning movements permitted
- Walk-with staggered Toucan crossing on QE Bridge
- Walk-with staggered Pedestrian Crossing on South College Street (could potentially be upgraded to a Toucan Crossing)
- The remote crossings on Riverside Drive and North Esplanade West would remain
- The proposed signal phasing and walk-with operation is provided in Figure 23.

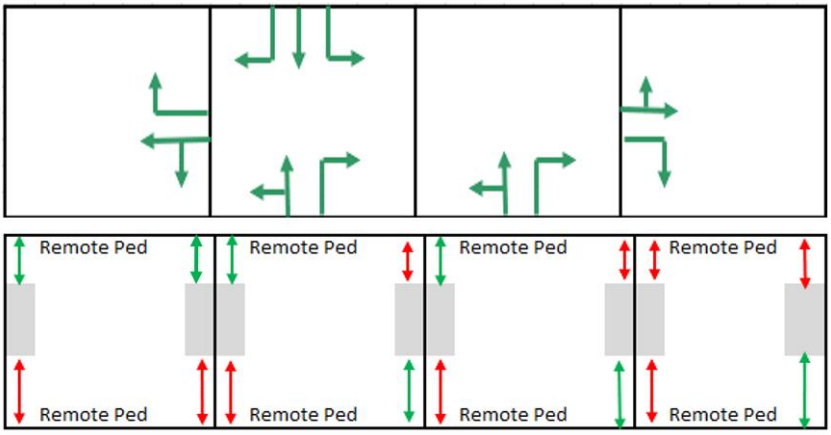


Figure 23. Option 3 – Proposed Signal Phasing & walk-with pedestrian crossing operation

Option 4

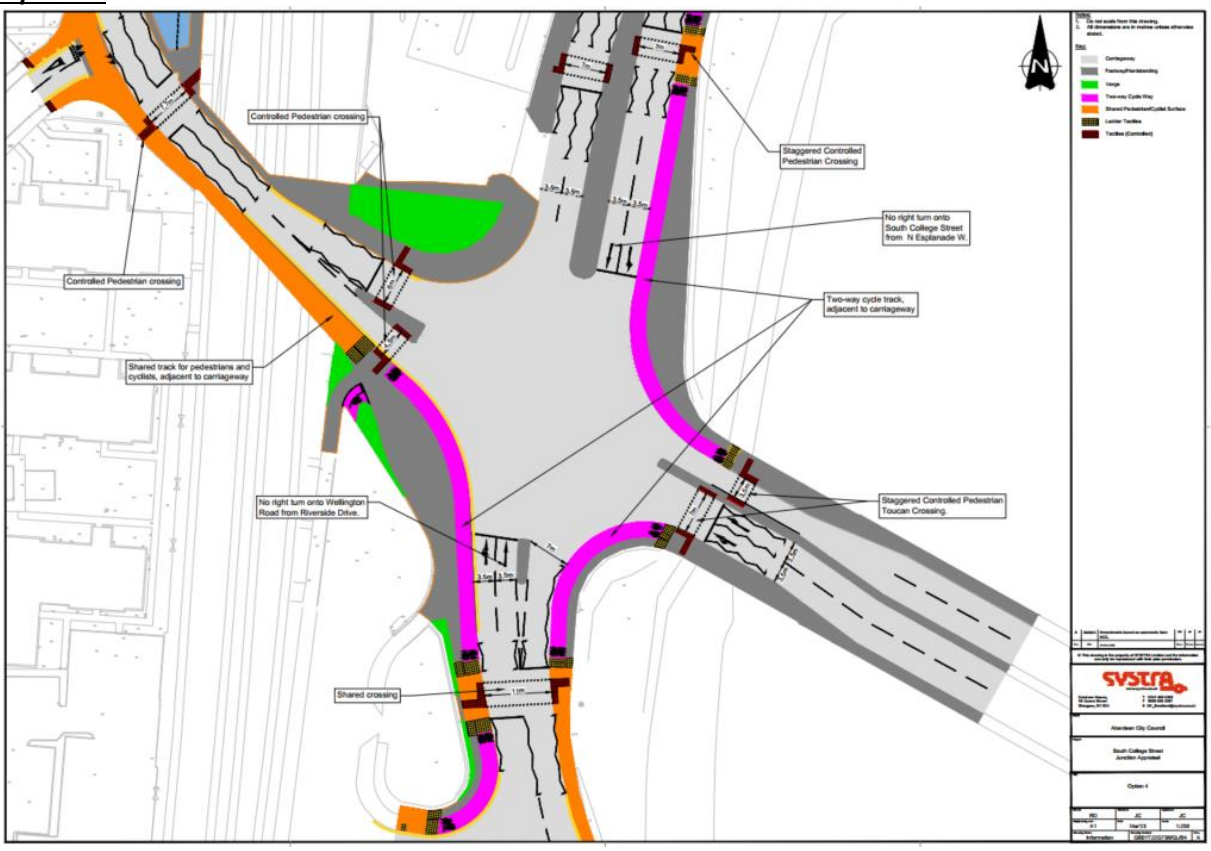


Figure 24. Option 4 Concept Design

- Signalised junction with banned right turn movement on North Esplanade West and Riverside Drive
- Walk-with Staggered Toucan crossing on QE Bridge
- Walk-with staggered Pedestrian Crossing on South College Street (could potentially be upgraded to a Toucan Crossing)
- The remote crossings on Riverside Drive and North Esplanade West would remain
- The proposed signal phasing and walk-with operation is provided in Figure 25.

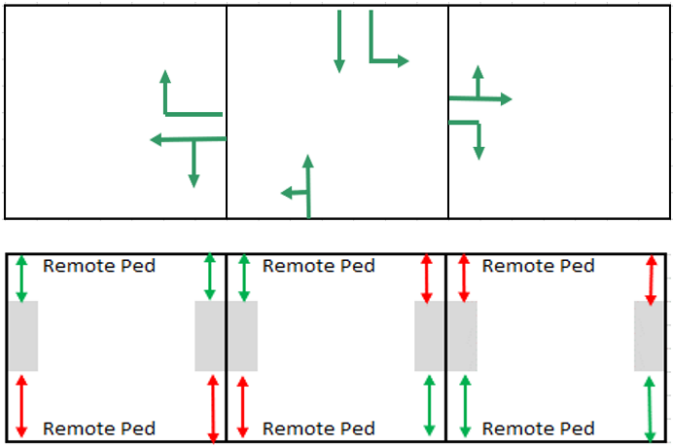


Figure 25. Option 4 – Proposed Signal Phasing & walk-with pedestrian crossing operation

7.3 Access Implications

7.3.1 For junction design Options 1-3, all traffic movements at the junction are permitted for all vehicle types. For Option 4, the banned right turns on Riverside Drive and North Esplanade West have routing implications for both general traffic and high sided vehicles.

Banned Right Turn on Riverside Drive

7.3.2 Figure 26 shows that traffic routing to Torry from the Riverside Drive area would require to route over King George VI Bridge and route to the Torry area via West Tullos Road, Abbotswell Road and Wellington Road. A controlled right turn facility is available at the Balnagask Road / Wellington Road signalised junction.

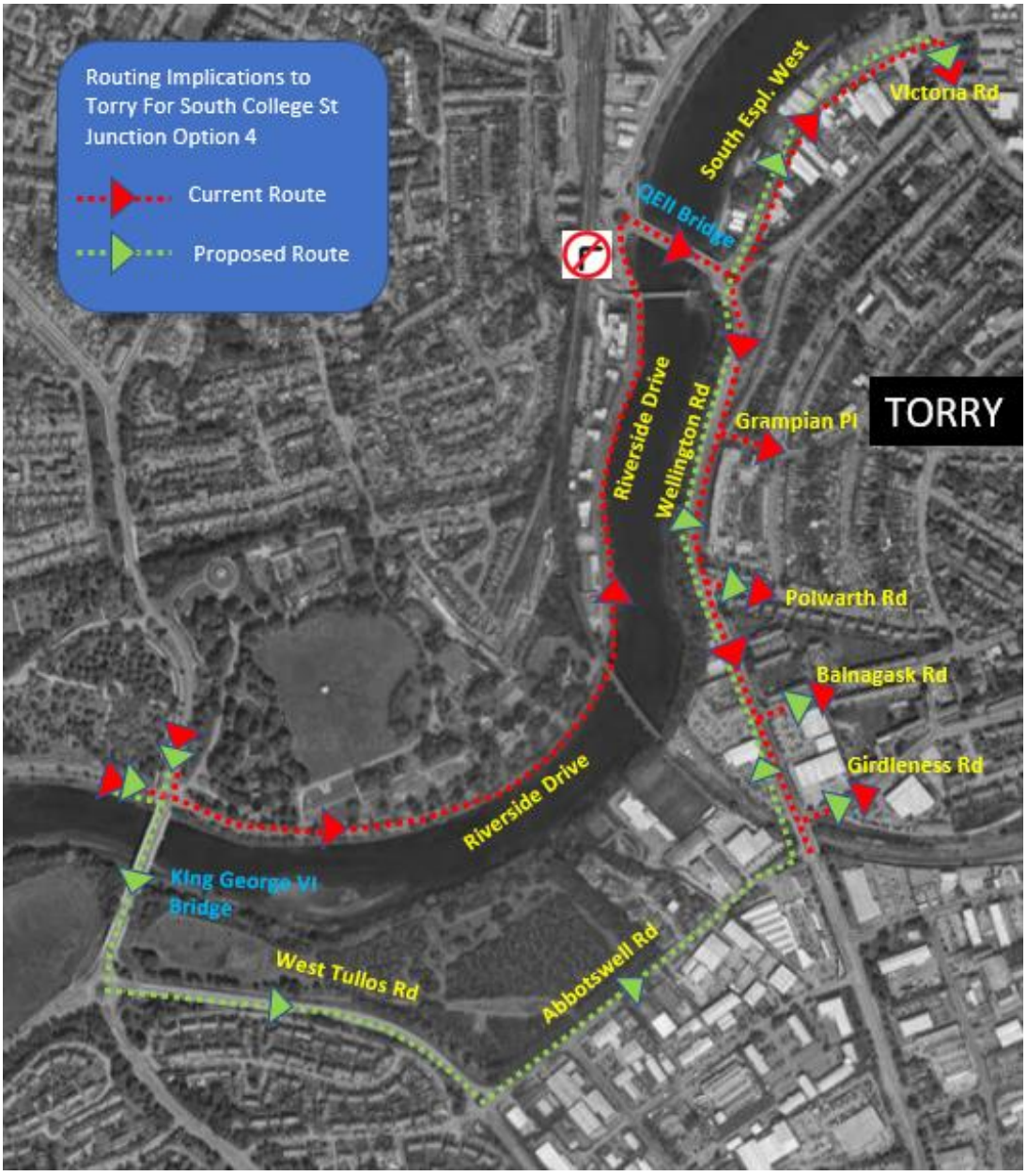


Figure 26. Implications of Right Turn Ban on Riverside Drive to QE Bridge for Access to Torry Area

Banned Right Turn on North Esplanade West

7.3.3 The right turn ban on North Esplanade West to South College Street will require general traffic to simply turn right at the new Palmerston Link Road (Part of the Phase 1 works – See Figure 27).

7.3.4 There is an implication to this for HGV routing. The railway bridge height restriction on Palmerston Place is 14'3''. The railway bridge height restriction on South College Street is 15'6'' (See Figure 12 in Section 3.5). This means that for HGV's that were previously below 15'6'' high and turned right from North Esplanade West to South College Street, the restrictions in place now means that only vehicles under 14'3'' would be able to make this manoeuvre.

7.3.5 It is worth noting that the average HGV height is 14'7" (according to HSE) and a standard flat bed lorry with a standard shipping container is 13'8'' high, so this would be able to route via Palmerston Place.

7.3.6 A review of traffic survey data from 2019 showed that, for southbound HGVs on North Esplanade West approaching the Roundabout with South College Street, in a 12 hour period 872 vehicles routed over QE Bridge, 121 vehicles routed to Riverside Drive and 25 vehicles turned right to South College Street.

7.3.7 It is therefore suggested that the right turn ban proposed on North Esplanade West in Option 4 should have little impact to the service vehicle routing around the city centre area. Any vehicle potentially affected would require to access South College Street from a different direction.

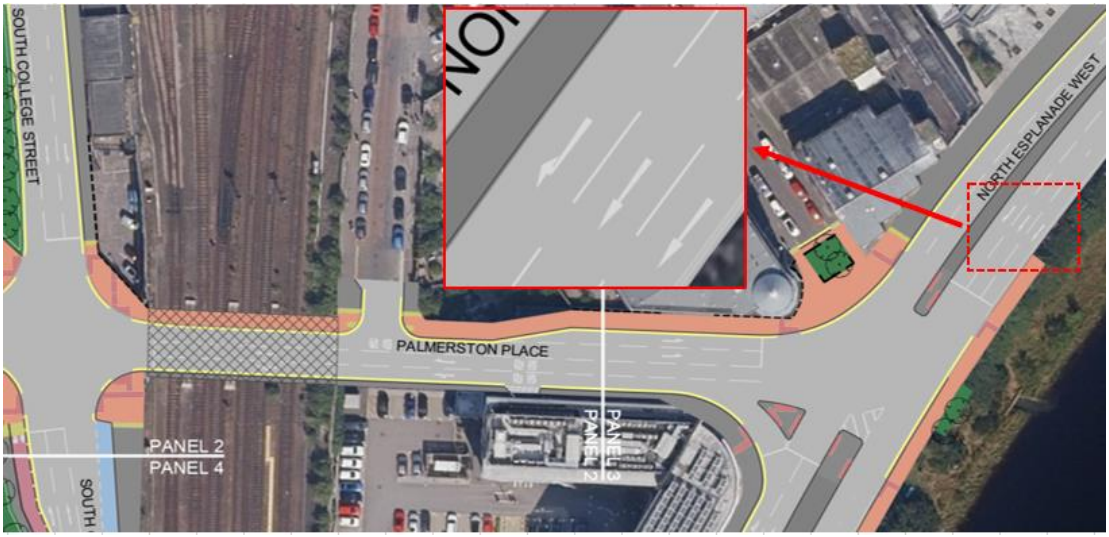


Figure 27. Alternative Right Turn Provisions on North Esplanade West

8. OPTION APPRAISAL

8.1 Introduction

8.1.1 The Option Generation and Development process (Chapters 6) identified four junction options for appraisal and detailed in Chapter 7.

8.1.2 This chapter details the performance of the four options against:

- Study Objectives
- STAG criteria (Environment; Climate Change; Health, Safety & Wellbeing, Economy, Equality & Accessibility)
- Established Policy Directives

8.1.3 An appraisal of the 4 options against the study objectives was undertaken to understand the ability of each to deliver for the study objectives. Five objectives for the study were agreed with ACC at the beginning of this commission.

8.1.4 These five objectives guided the option generation and development and while the objectives have remained fixed throughout the entire appraisal process, their measure and method of analysis has been adjusted, in line with the STAG principle of 'SMARTening' study objectives as the appraisal progresses.

8.1.5 The updated measure and method of analysis guiding the appraisal of option performance against the study objectives is set out in Table 12.

Table 12. Study Objectives & Updated method of Analysis

Objective	Ref.	Measure	Method of Analysis
Improve Pedestrian, Wheeling, and cycling connectivity	1.1	Reduce Walk distances and travel time through the junction	A-B distance/time comparisons (Existing vs Option)
	1.2	Improve Cycle connections and travel time through the junction	A-B distance/time comparisons (Existing vs Option)
Ensure safe and equitable access for all	2	Increase controlled crossing points for all users	Comparison against existing provision
Maintain public transport connections	3.1	Futureproof designs to allow for potential PT priority measures	Assessment of Potential bus priority options
	3.2	Assessment of bus journey times through the junction	Existing vs Option (traffic model analysis)
Maintain freight connections through the junction	4.1	Assessment of key freight movements to and from the Harbour area	Assessment of HGV traverse through the junction
	4.2	Assessment of HGV journey times	Assessment of existing vs required provision. Existing vs Option (traffic model analysis)
Optimise the traffic network performance to facilitate the introduction of the City Centre Masterplan	5.1	Assessment of journey times	Existing vs Option (traffic model analysis)
	5.2	Assessment of queue lengths	Existing vs Option (traffic model analysis)
Network Resilience	6	Ability to cater for incidents, emergency vehicles	Review of Junction Design
Appraisal Against STAG Criteria (Part 1)	7	Design feasibility & risk	
	8	Anticipated stakeholder response	
	9	Estimated construction costs - TBD	
Appraisal Against STAG Criteria (Part 2)	10	Environment	
	11	Health, Safety & Wellbeing	
	12	Economy	
	13	Equality & Accessibility	
Appraisal Against ACC Criteria	14	Established Policy Directives	

8.1.6 In addition to the appraisal against the study objectives, an initial qualitative appraisal has been undertaken against STAG criteria Part 1 and 2, and established policy directives.

8.1.7 In line with STAG, the appraisal of options is undertaken using a seven-point assessment scale, as set out in Table 13.

Table 13. STAG 7-Point Scale

STAG 7-Point Scale	
✓✓✓	Option has major positive impact
✓✓	Option has moderate positive impact
✓	Option has minor positive impact
-	Option has neutral or no impact
✖	Option has minor negative impact
✖✖	Option has moderate negative impact
✖✖✖	Option has major negative impact

8.2 Option Modelling Assessment

8.2.1 The four options presented in Chapter 7 were assessed in the Aberdeen City Centre Paramics traffic model in order to provide quantitative evidence to support their performance against the study objectives.

8.2.2 Utilising the 2025 Reference Case model defined in Chapter 5, the four options were coded into variants of the model. To inform the assessment of option performance, the four models were assessed and compared to the 2025 Reference Case for:

- Bus journey times through the junction to Guild Street
- HGV journey times through the junction too the Harbour
- General traffic journey times on all approach routes through the junction
- Queue length assessment
- Traffic flows through the junction

8.2.3 The assessment of bus journey times through the junction to and from Guild Street is detailed in Section 8.3.21.

8.2.4 The assessment of HGV journey times through the junction to the harbour is detailed in Section 8.3.27

8.2.5 General traffic journey times on all approach routes through the junction is summarised in Section 8.3.32. The relative journey time graphs are provided in Appendix B

8.2.6 Traffic queue lengths for all approach routes through the junction is summarised in Section 8.3.36. The relative queue length graphs are also provided in Appendix B.

Modelled Junction Option Traffic Capacity

8.2.7 The volume of traffic that routes through the junction does not form part of the options appraisal requirements, however, it is considered relevant to provide this model data to understand the junction capacity performance of each junction design option.

8.2.8 1 provides the 12 hour (07:00-19:00) traffic flows through the junction per arm for the four junction design options.

Table 14. Model Traffic Flows through the Junction

Traffic Flow by Arm	Approach to Junction	12 Hour Model Traffic Flows (Veh) - 07:00-19:00								
		2025 Ref Case	Option 1		Option 2		Option 3		Option 4	
		Value	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref
North Esplanade W	SB	7784	7718	-67	7642	-143	6765	-1019	7406	-378
Riverside Dr	NB	7790	7830	40	7784	-6	7288	-502	5933	-1856
QEIi Bridge	WB	8003	7946	-57	7993	-11	7399	-604	7530	-474
Sth College St	EB	4402	4400	-2	4511	109	4283	-119	5194	792
Junction Total Flow		27980	27893	-87	27929	-51	25735	-2244	26063	-1916
% Diff to Ref Case				**-0.3%**		**0%**		**-8%**		**-7%**

8.2.9 It should be noted that standard signalised junctions have approximately 20% less traffic capacity than a standard roundabout. 1 shows that the traffic demand efficiency is improved from this standard in the signal junction Options 3 and 4, due to the optimisation of the signal phasing, timings, and removal of some crossing provisions from the junction.

8.2.10 For Option 1 and 2, the junction capacity is very similar to the Reference Case, suggesting that neither of these scenarios are likely to result in additional delays at the junction.

8.2.11 For Option 4, there is a noted increase in traffic routing southbound on South College Street compared to all other scenarios (5194 vehicles). This may be due to the banned right turn on Riverside Drive resulting in vehicles diverting through the Ferryhill area.

8.2.12 Further model analysis shows that in this scenario, the traffic flows on Milburn Street and Ferryhill Road eastbound are higher by 20-30%. Some traffic management mitigation may be required through these areas if Option 4 was taken forward. This potential issue is noted in the 'Benefits and Risks' of each junction scenario detailed in Section 8.7.

8.3 Appraisal Against Objectives

Objective 1: Improve pedestrian, wheeling and cycling connectivity

8.3.1 As set out in the option concept drawings, all proposed options will provide improved pedestrian, wheeling, and cycling crossings through the junction. In order to quantify such benefits, 2 sub-criteria (1. Walking, 2.Cycling) have been defined with the resultant performance of each option set out below. Within each travel mode, the travel distance and wait time criteria have been considered separately

1.1: Reduce walk distances and travel time through the junction

8.3.2 To assess the performance of each option against the objective measure, total walk distance was calculated for each option and for the existing junction based on the locations (A-J) shown in Figure 28. These walk distances were calculated based upon pedestrians crossing at controlled crossings points only.

8.3.3 Table 15 provides a summary of the total walk distance combined between all the points detailed in Figure 28.

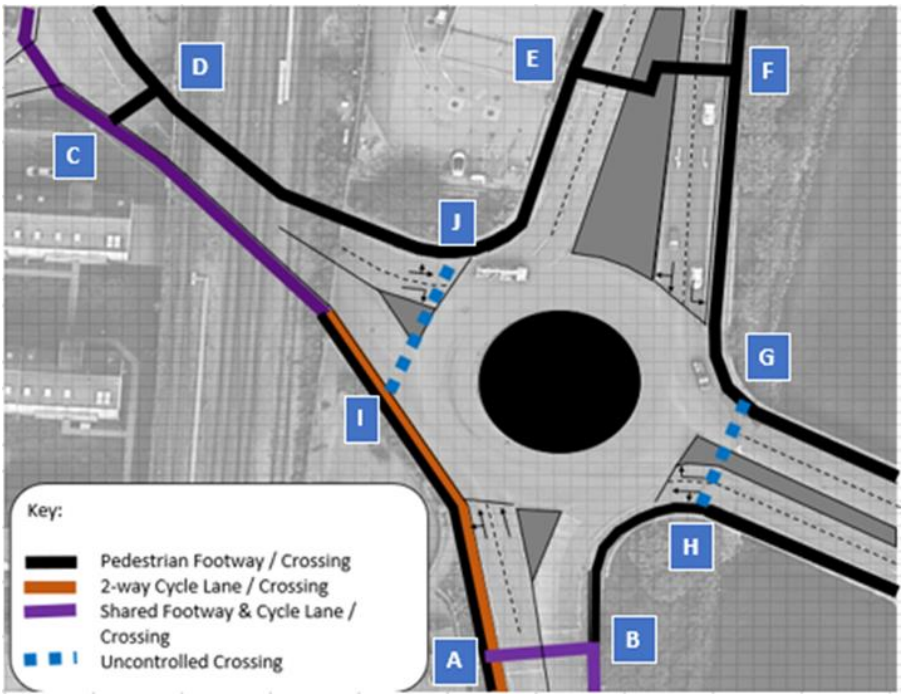


Figure 28. Walk Distance Locations (Reference Case)

Table 15. Total Walk Distance through controlled crossings

Metric	Ref Case	Option 1	Option 2	Option 3	Option 4
Total Walk Distance (m)	**4046**	**3053**	**2803**	**2750**	**2714**
Diff to Ref Case		-993	-1243	-1296	-1332
% Diff to Ref Case		-25%	-31%	-32%	-33%
Appraisal		✓✓	✓✓✓	✓✓✓	✓✓✓

8.3.4 All options show a significant improvement on the Ref Case scenario, primarily due to the new crossing on QE Bridge in all options. Options 2, 3, and 4 were relatively similar but Option 1 had a slightly higher total walk distance due to the location of the crossing on QE Bridge.

8.3.5 Although an uncontrolled crossing was included on South College Street in Option 1 and 2, the provision of alternative crossing locations resulted in this not being a major factor in the overall walk-distance calculations.

8.3.6 For the travel time consideration, it is not possible to consider the crossing delay time for each route as there are options available to pedestrians to cross at an uncontrolled crossing or potentially walk further to a controlled crossing. The wait time calculation for pedestrians was therefore based upon the number and type of crossing provision within each option.

8.3.7 To enable a quantitative assessment of the wait time within each option, the following average wait time assumptions were derived for each crossing type:

- Remote Pedestrian Crossing = 30 seconds (observed wait time)
- Crossing with the signal phasing = 50 seconds (average of between 0 and 100 seconds on a 120 second cycle)
- Uncontrolled crossing = 120 seconds (general assumption, consistent for each scenario and location)

8.3.8 Table 16 provides a summary of the pedestrian wait time assessment. Table 17 provides the resultant pedestrian walk distance and travel time appraisal score.

Table 16. Pedestrian Wait Time Appraisal

Option	No. of Crossing Provisions			Total Wait Time	Appraisal
	Remote Peds	Within Junction Cycle	Uncontrolled		
Ref Case	3	0	2	330	-
Option 1	4	0	1	240	✓
Option 2	4	0	1	240	✓
Option 3	3	2	0	190	✓✓
Option 4	3	2	0	190	✓✓

Table 17. Resultant Pedestrian Walk Distance & Time Appraisal (Objective 1.1)

Option	Distance	Time	Appraisal
Option 1	✓✓	✓	✓
Option 2	✓✓✓	✓	✓✓
Option 3	✓✓✓	✓✓	✓✓✓
Option 4	✓✓✓	✓✓	✓✓✓

1.2: Improve Cycle connections and travel time through the junction

8.3.9 To assess the performance of each option against the cycle objective measure, the total cycle distance was calculated for each option and for the existing junction based upon the 4 approach locations detailed in Figure 29.

8.3.10 The figure on the left shows the segregated cycle route for the Reference Case and for Option 1, whilst the figure on the right shows the segregated cycle route for Options 2, 3 and 4 (due to the proposed Toucan crossing on QE Bridge).

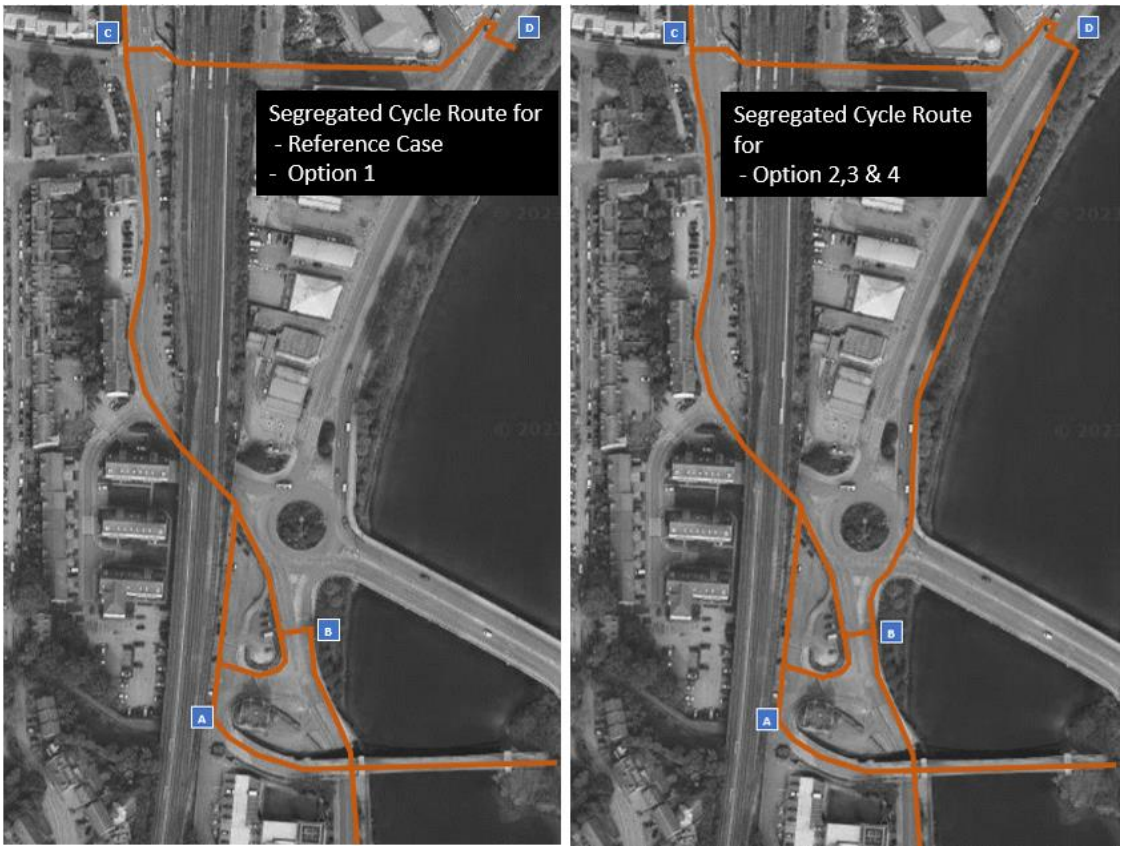


Figure 29. Cycle Distance locations and Routes

8.3.11 Table 18 provides a summary of the cycle distances calculated between the four locations detailed in the above figures.

Table 18. Cycle Distances (Using segregated cycle paths)

		Approx. Cycle Distance using cycle lanes (m)				
Ref.	Movement	Ref Case	Option 1	Option 2	Option 3	Option 4
1	A-B	97	97	97	97	97
2	A-C	350	350	350	350	350
3	A-D	550	550	387	387	387
4	B-C	318	318	318	318	318
5	B-D	518	518	305	305	290
6	C-D	200	200	200	200	200
	Total	**2033**	**2033**	**1657**	**1657**	**1642**
	Diff to Ref Case		**0**	**-376**	**-376**	**-391**
	Appraisal		-	✓✓	✓✓	✓✓

8.3.12 For the cycle travel time consideration, the junction wait time calculation was also considered appropriate to provide a quantative comparison for travel time between the junction options.

8.3.13 Table 19 provides the number and type of crossing between each of the four locations identified. The wait time assumptions utilised for the pedestrian delay time is then applied to the route to derive a total delay figure for each option.

Table 19. Cyclists Wait Time Appraisal

Option	Movement	Number of Crossings Required									
		Ref Case		Option 1		Option 2		Option 3		Option 4	
		Remote	Signal	Remote	Signal	Remote	Signal	Remote	Signal	Remote	Signal
1	A-B	1		1		1		1		1	
2	A-C		1		1		1		1		1
3	A-D	2	2	2	2	1	2	1	2	1	2
4	B-C	1	2	1	2	1	2	1	2	1	2
5	B-D	3	2	3	2		2		2		2
6	C-D	2	1	2	1	2	1	2	1	2	1
	Ave Wait Time	30	50	30	50	30	50	30	50	30	50
	Sub Total	270	400	270	400	150	400	150	400	150	400
	Option Total		**670**		**670**		**550**		**550**		**550**
	Appraisal				-		✓		✓		✓

8.3.14 Table 20 provides the resultant cycle travel distance and travel time appraisal score.

Table 20. Resultant Pedestrian Walk Distance & Time Appraisal (Objective 1.2)

Option	Distances Appraisal	Time Appraisal	Overall Appraisal
Option 1	-	-	-
Option 2	✓✓	✓	✓✓
Option 3	✓✓	✓	✓✓
Option 4	✓✓	✓	✓✓

Objective 2: Ensure safe and equitable access for all

8.3.15 Controlled crossing points provide a much safer crossing experience compared to an uncontrolled crossing for all users. People with physical, visual, or hearing impairments particularly require controlled pedestrian crossings to safely traverse a junction. At-junction crossings are more appealing than remote crossing locations at remote crossings often mean users must walk longer distances to cross safely. This may result in some users not utilising a crossing and attempting to cross out-with the protection of the crossing. As noted above, longer walk distances can be problematic to some users, for example those with mobility issues.

8.3.16 A comparative assessment was undertaken for the number of controlled and uncontrolled crossings provided within each scenario. The number of controlled crossings that were remotely located or were within the junction signal phasing was also identified.

8.3.17 Table 21 provides a summary of the crossing provisions for each Option. A scoring mechanism was developed that scored the crossing provisions as follows:

- Within signal junction - positive (+2)
- Remote crossing - positive (+1)
- Uncontrolled crossing - negative (-1)

Table 21. Controlled Crossing Provisions Review

Scenario	Controlled Crossing Points	No. At Junction	No. Remote	Uncontrolled Crossing Points	Calculated Score	Appraisal
Ref Case	3	0	3	2	1	-
Option 1	4	0	4	1	3	✓
Option 2	4	1	3	1	4	✓✓
Option 3	5	2	3	0	7	✓✓✓
Option 4	5	2	3	0	7	✓✓✓

Objective 3: Maintain Public Transport Connections

3.1: Futureproof designs to allow for potential PT priority requirements

8.3.18 Whist few bus services route through the South College Street junction at present, consideration must be given to futureproofing the junction for potential new bus priority measures. The Aberdeen Rapid Transit (ART) route may utilise this junction to connect the city centre to a new transport interchange at Portlethen.

8.3.19 An uncontrolled junction design does not easily enable bus priority measures to be incorporated at a later date, whereas a signal controlled junction can be amended to manage the traffic demand to prioritise a bus route corridor or to enable dynamic operation of the signal timings by utilising bus transponders to active a hurry call at the junction.

8.3.20 Table 22 summarises the potential for each of the junction design options to cater for future public transport priority changes.

Table 22. Assessment of Potential Bus Priority Options

Scenario	Junction Design	Comment	Appraisal
Option 1	Roundabout	Little scope to provide bus priority on approach to an uncontrolled roundabout. All approach lanes utilised for specific movement purpose. Only option would be bus lanes on approach arms which ended before the junction, significantly impacting on the corridor capacity	✖
Option 2	Roundabout	Little scope to provide bus priority on approach to an uncontrolled roundabout. All approach lanes utilised for specific movement purpose. Only option would be bus lanes on approach arms which ended before the junction, significantly impacting on the corridor capacity	✖
Option 3	Signalised Junction	Whilst all approach lanes are required for specific traffic movements, a signalised junction allows controlled egress per arm - e.g. Bus transponders can be utilised for a hurry call at the junction.	✓
Option 4	Signalised Junction	Whilst all approach lanes are required for specific traffic movements, a signalised junction allows controlled egress per arm - E.G. bus Transponders can be utilised for a hurry call at the junction.	✓

3.2: Assessment of bus journey times through the junction

8.3.21 Bus journey time data was extracted from the traffic model for routes set up between Wellington Road and Guild Street (Bus Station) – See Figure 30. As per current bus route operation , Citylink buses route to the station either via South College Street or Market Street. The bus journey time was averaged over a 12 hour period (7am-7pm).

8.3.22 The modelled average bus journey times are detailed in Table 23, along with the appraisal outcome.

Figure 30. Modelled Bus Routes

Table 23. Average Bus Journey Times

Route	Average Journey Time (Seconds) 07:00-19:00										
	2019 Base	2025 Ref Case WP		Option 1		Option 2		Option 3		Option 4	
	Value	Value	-	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref
Wellington Rd to Market St/Guild St Via North Esplanade W	355	290		293	3	291	1	324	34	315	26
Wellington Rd to Market St/Guild St Via South College St	483	388		393	5	395	6	420	31	422	33
Market St/Guild to Wellington Rd St Via North Esplanade W	252	258		265	7	268	10	318	60	286	28
Market St/Guild to Wellington Rd St Via South College St	319	359		362	3	356	-3	423	64	383	24
Average	352	324	-	328		327		371		351	
Diff to 2025 Ref Case			-		**4**		**3**		**47**		**27**
Diff to 2019 Base			-28		-24		-25		19		-1
Appraisal					-		-		✘		✘

8.3.23 The table shows that, as expected, the journey times for Option 1 and 2 are hardly impacted by the junction designs. The additional delay to the journey times can be applicable to the addition of remote crossings on QE Bridge.

8.3.24 For Options 3 and 4, there is a low level of additional delay due to the natural additional delay associated with a traffic signalised junction. The average delays of 47 seconds for Option 3 and 27 seconds for Option 4 are lower than the average delay anticipated within the 120 second cycle due to the optimisation of the signal phasing. Option 4 has marginally less delay than Option 3 due to the three phase signalised junction design.

8.3.25 Overall, the small delays to buses routing to and from the city centre in Option 3 and 4 are potentially offset by the opportunities that the signalised junction designs have to control bus egress if necessary and enable futureproofing of the junction for bus priority measures.

Objective 4: Maintain Freight Connections

4.1: Assessment of Key Freight Movements to and from the Harbour Area

8.3.26 As detailed in Figure 8, the A956 Wellington Road (via Queen Elizabeth II Bridge) and A956 North Esplanade West corridor serves as the signposted freight route through the city centre to and from Aberdeen Harbour. The junction design therefore needs to maintain the freight connections through this junction.

Table 24 provides a review of each option in reference to the freight movement requirements.

Table 24. Review of Key Freight Movements through the Junction

Scenario	Junction Design	Comment	Appraisal
Option 1	All movements permitted	Single lane movement around roundabout. Potential lane encroachment for longer vehicles	-
Option 2	All movements permitted	Single lane movement around roundabout. Potential lane encroachment for longer vehicles	-
Option 3	All movements permitted	Single lane movement through signal controlled junction	✓
Option 4	All movements permitted	Single lane movement through signal controlled junction	✓

4.2: Assessment of HGV Routes

8.3.27 Any increase to the distance that HGV drivers are required to route to reach the harbour area would be detrimental to the objective to maintain freight connections. In each option, freight traffic will still be accommodated through the South College Street junction and thus, no changes to the HGV travel distance is anticipated.

8.3.28 The trip distance is more critical to freight operators than travel time, however, HGV journey time data was also considered.

8.3.29 The HGV journey time data was extracted from the traffic model for routes set up between Wellington Road and Commercial Quay (Harbour) – See Figure 30. The HGV journey time was averaged over a 12 hour period (7am-7pm) and is summarised in Table 25.

8.3.30 As per the Bus Journey Time analysis, the signalised junction Options 3 and 4 incur a slight delay due to the natural delays associated with a traffic signalised junction.

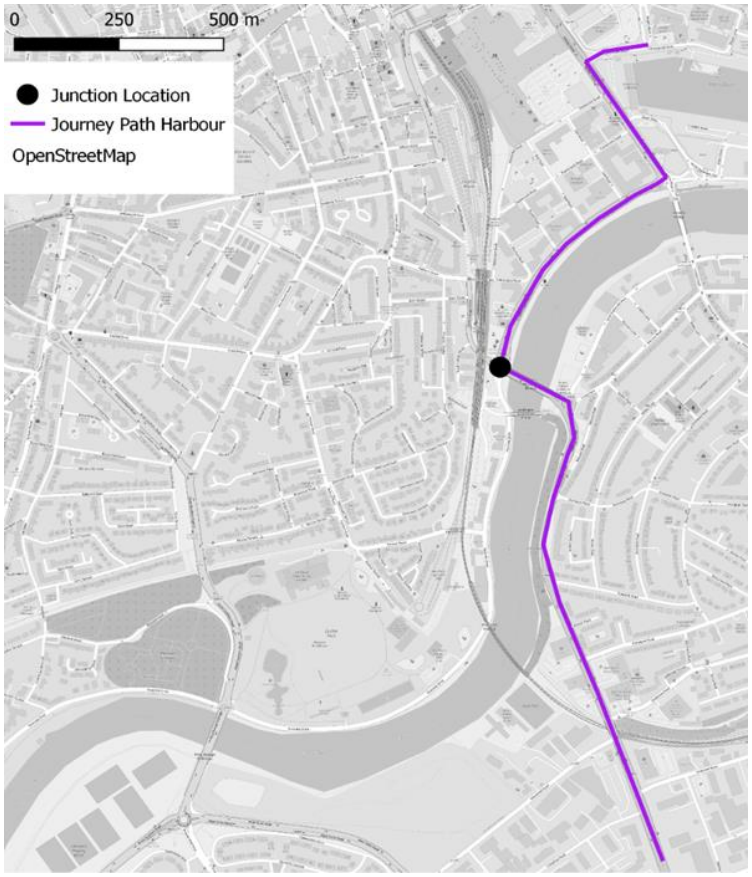


Figure 31. Freight Route Journey Time Assessment

Table 25. Modelled HGV Journey Times

Route	Average Journey Time (Seconds) 07:00-19:00									
	2019 Base	2025 Ref Case		Option 1		Option 2		Option 3		Option 4	
	Value	Value	-	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref
Wellington Rd to Harbour Via North Esplanade W	305	268	-	271	3	270	2	303	35	294	26
Harbour to Wellington Rd Via North Esplanade W	289	318	-	330	12	329	11	382	64	345	27
Average	**297**	**293**	-	**301**	8	**300**	7	**343**	50	**320**	27
Diff to 2019 Base			-4		4		3		46		23

8.3.31 Table 25 shows that whilst the average journey time is slightly longer in Option 3 and 4, the distance travelled to the Harbour area is exactly the same. It is therefore considered that none of the four options would have a detrimental impact on the freight routes through this part of the network.

Table 26. HGV Routing Appraisal

Option	HGV Distance Appraisal	HGV Journey Time Appraisal	Overall Appraisal
Option 1	-	-	-
Option 2	-	-	-
Option 3	-	✖	-
Option 4	-	✖	-

Objective 5: Optimise the Traffic Network performance to facilitate the impact of the City Centre Masterplan

5.1: Assessment of General Traffic Journey Times

8.3.32 General traffic journey times were collated within the model for the four key routes on approach to the junction as detailed in Figure 32. To be explicitly clear, the four journey routes identified end at the point of crossing the study junction stop line.

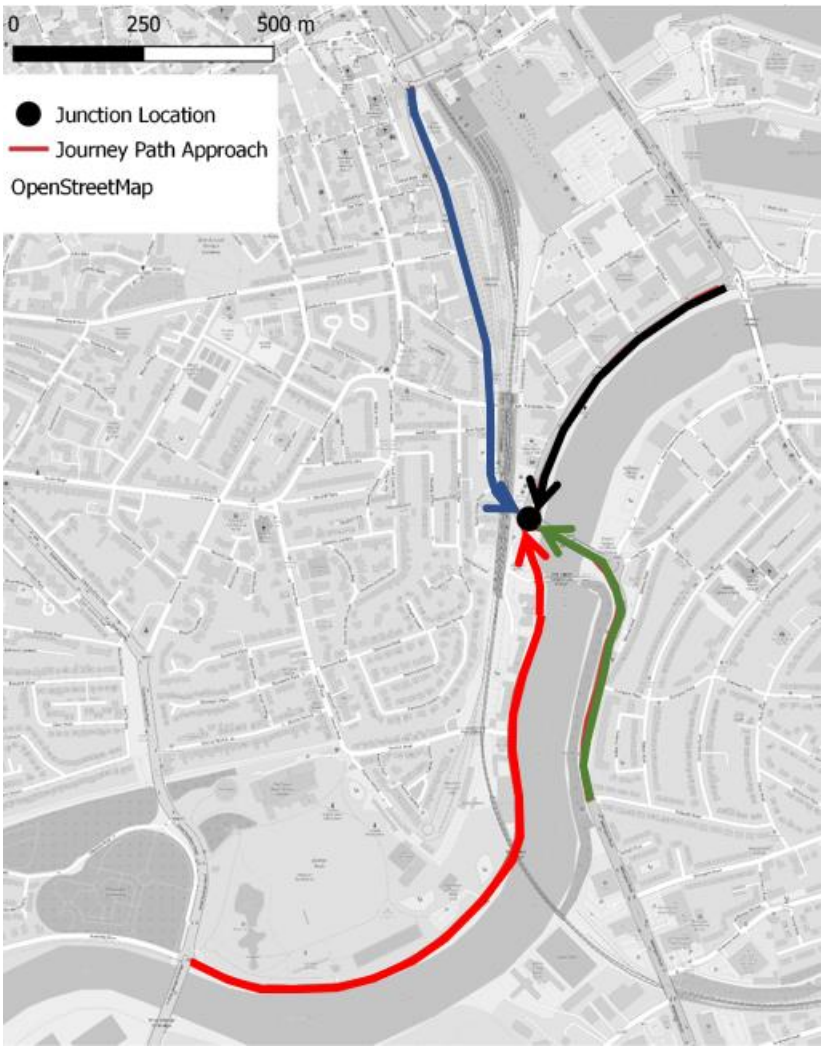


Figure 32. General Traffic Journey Time Routes

8.3.33 Table 27 presents the 12 hour average journey times (07:00-19:00) through the four approach routes for each of the junction options.

Table 27. General Traffic Journey Times

Route	Average Journey time 0700-1900 (Seconds)									
	2019 Base	2025 Ref Case	Option 1		Option 2		Option 3		Option 4	
	Value	Value -	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref
North Esplanade West	66	79 -	80	1	83	5	133	54	101	22
Riverside Drive	109	102 -	101	-1	103	1	152	50	149	47
QEII Bridge	89	57 -	60	4	57	0	95	39	91	34
South College St	151	164 -	161	-3	158	-6	226	62	190	26
Average	104	100	101		100		151		132	
Diff to 2025 Ref Case		-		0		0		51		32
Diff to 2019 Base		-3		-3		-3		48		29
Appraisal				-		-		✘		-

8.3.34 As detailed in the bus and HGV journey time assessments, the signalised junctions of Option 3 and 4 incur an additional delay applicable to the natural delays associated with signalising a junction. Option 4 has less delay than Option 3 due to the lower three stage junction signal configuration. Both Option 3 and 4 include optimisation of the signals to maximise the capacity of the junction.

8.3.35 Option 1 and 2 essentially retain the roundabout configuration and as such, additional delays are minimal.

5.2: Assessment of Queue Lengths

8.3.36 Vehicle queue lengths on approach to the junction were also extracted from the model for the four approach routes detailed in Figure 32.

8.3.37 It is firstly worth noting the similar queue levels between the 2025 Ref Case and the 2019 Baseline except on QE Bridge. As noted from the 2022 ATC data, traffic demand through Wellington Road is 20% lower than in 2019, therefore queue levels are lower. The queue graphs shown in Appendix B highlights the differences since 2019.

8.3.38 Table 28 presents the average number of vehicles in a queue for each of the four approach arms to the junction.

Table 28. Average No. Vehicles in a Queue

Approach Arm	Average Number of Vehicles in a Queue 0700-1900 (Veh)									
	2019 Base	2025 Ref Case WP	Option 1		Option 2		Option 3		Option 4	
	Value	Value -	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref	Value	Diff to Ref
North Esplanade West	8.7	19.5 -	19.8	0.3	20.2	0.8	25.4	6.0	22.7	3.2
Riverside Drive	4.5	4.3 -	4.3	0.0	4.6	0.2	12.7	8.4	8.8	4.5
QEII Bridge	19.7	11.2 -	10.7	-0.5	9.8	-1.4	16.9	5.7	15.9	4.7
South College St	13.7	17.2 -	16.6	-0.6	16.5	-0.7	20.6	3.4	16.4	-0.9
Appraisal				-		-		✘		-

8.3.39 The model average queue length results follow a similar trend to the average journey time results as anticipated. There is slightly higher queueing in Option 3 and 4 due to the natural delays associated with a traffic signal junction.

8.3.40 In all options, the traffic generally clears within the applicable signal phase green time (except during the PM peak, where queueing increases in all scenarios – see Appendix B).

8.3.41 Only Option 3 displays a slight change in the queuing profile compared to the other junction options (See Appendix B – Queuing on QE Bridge Arm). The higher peak in the graph suggests that the four stage signal junction may add slightly more delay than just the natural lost time at a signalised junction. The appraisal scoring reflects this difference in Option 3.

Objective 6: Network Resilience

8.3.42 The measure of network resilience has been considered in three areas: public transport resilience; general traffic resilience; and emergency vehicle access. The junction design options have been assessed against these three criteria as detailed in Table 29.

Table 29. Network Resilience

Objective	Measure	Measure	Method of Analysis	Option			
				1	2	3	4
6. Optimise Network Resilience	6A	Public transport resilience	Public transport resilience	-	-	✓	✓
	6B	General traffic resilience (e.g. accommodate incident in traffic network)	General traffic resilience	-	-	✓✓	✓✓
	6C	Provide emergency vehicle access in all directions	Provide emergency vehicle access in all directions	✓	✓	✓	✖
Appraisal				-	-	✓✓	✓

8.3.43 As previously noted, the signalised junction Options 3 and 4 allow for a hurry call for Buses if required. This may be part of the ART operation mechanism. The roundabout Option 1 and 2 do not provide the junction control required to fast-track buses through the junction.

8.3.44 Similarly, for road network incidents, extended signal green time can be applied to the junction in Option 3 and 4 to flush out long queues or re-routed traffic generated by a network incident.

8.3.45 Option 4 includes a banned turn from North Esplanade West to South College Street. This is not essential for emergency vehicles as they can utilise the Palmerston Place Link Road. Note that the Palmerston Place link road has a height restriction of 14'3'' and the regulations for Fire Tender access is a minimum headroom of 3.7m (12'1.6''). Therefore the Palmerston Link road is suitable for all emergency vehicles.

8.3.46 In Option 4, the banned right turn from Riverside Drive to QE Bridge may cause emergency vehicles some delay in making this emergency manoeuvre as the signal lights would not be set up to provide a gap in the traffic. This may be over come through careful signal design.

8.4 Appraisal Against STAG Criteria

8.4.1 The identification of suitable options for an effective, feasible, and deliverable intervention that has demonstrable benefits for all modes is an objective-led assessment following STAG principles.

8.4.2 A high-level qualitative appraisal against the recognised STAG criteria is undertaken at this stage to highlight any potential conflicts or red-flags with the criteria which may require

further investigation or rule out a particular option. A summary of the option appraisal against STAG criteria is provided in the following sections for the following measures:

- Environment
- Health, Safety & Wellbeing
- Economy
- Equality & Accessibility

Environment

Table 30. STAG Criteria - Environment

STAG Criteria	Appraisal Summary	Appraisal			
		Op1	Op2	Op3	Op4
Environment	Scheme demonstrates a positive effect on biodiversity. Opportunity for enhanced green spaces along verge spaces, enhanced footways, central reservation, roundabout island etc to make the scheme greener, more visually appealing and reduce its impact on the natural environment. Construction will take place in an already built-up urban area so there will be neutral impacts on land use, biodiversity, habitats, geology and soil. Engineering works will cause some temporary disruption during construction. All required works will be at a highly localised level. Strategically, alternative Bridges across the Dee could be utilised during the works. The new link road through Palmerston Place would also facilitate alternative routing during construction. There is scope to encourage modal shift around the city via the prioritisation of active and sustainable modes of transport, which will further contribute to emissions reductions. The addition of traffic signals increase vehicle dwelling time, which results in higher emissions. The impacts of this will be mitigated to an extent by the implementation of the LEZ	-	✓	✓	✓

Health, Safety & Wellbeing

Table 31. STAG Criteria – Health, Safety & Wellbeing

STAG Criteria	Appraisal Summary	Appraisal			
		Op1	Op2	Op3	Op4
Health, Safety & Wellbeing	The implementation of improved crossing facilities (included increased crossing frequency and reduced walk distances) and segregated cycle facilities should reduce the potential for accidents at the junction, making it a safer space for pedestrians and cyclists. Some current crossing locations and pavement provision can be perceived as being unsafe and improved crossings through the junction should improve safety. Option 1 still includes an uncontrolled crossing at the southern end of South College Street There is scope to encourage modal shift around the city via the prioritisation of active and sustainable modes of transport, which may improve the health outcomes of users.	✓	✓✓	✓✓	✓✓

Economy

Table 32. STAG Criteria - Economy

STAG Criteria	Appraisal Summary	Appraisal			
		Op1	Op2	Op3	Op4
Economy	Access and egress for freight between the harbour and Wellington Road (Designated Freight Route) is maintained in all options. Access to and from the city centre area for general traffic, service vehicles, and delivery vehicles from Aberdeen South is maintained in all options Improvements to active travel measures may encourage more leisure trips into the area	✓	✓	✓	✓

Equality & Acceptability

Table 33. STAG Criteria – Equality & Acceptability

STAG Criteria	Appraisal Summary	Appraisal			
		Op1	Op2	Op3	Op4
Equality & Accessibility	Additional cycle provisions will enhance the Phase 1 proposals to provide a connected off-road cycle network on all arms of the junction (except for Option 1). The additional crossing on QEII Bridge and South College Street allows pedestrians to traverse the junction in all directions under a controlled crossing arrangement. (Option 1- uncontrolled on South College Street)	✓	✓✓	✓✓	✓✓

8.5 Appraisal Against Policy Directives , Feasibility, Affordability & Public Acceptability

8.5.1 In additional to appraisal against Objectives and STAG Criteria, STAG includes the appraisal of options against Established Policy Objectives, feasibility, affordability and public acceptability.

Policy Directives

8.5.2 STAG embraces Scottish Government policy across a range of areas. As part of the options appraisal, an assessment on how options perform against current local and national policy objectives should be undertaken. For this commission, a review of ACC adopted policy concluded all 4 options will **positively align** with **established policy objectives** for the following:

- Local Outcome Improvement Plan
- Regional Economic Strategy
- Strategic and Local Development Plan
- National, Regional and Local Transport Strategy
- Sustainable Urban Mobility Plan
- Roads Hierarchy
- Net Zero Vision and Route map for Aberdeen
- Mobility Strategy

8.5.3 A summary of the assessment against established policy directives is provided in **Appendix C**.

Option Feasibility

Table 34. Feasibility of Design

Option	Feasibility of Design	Design Risk	Appraisal
Option 1	1.Limited impact on the existing network with only the requirement for a remote pedestrian crossing on QEII Bridge. 2. Foundations for signal poles and power connection feasible (given existing street lighting across the bridge). 3. Replacement of drainage kerbs and amendments to drainage system on QEII bridge to install pedestrian crossing required. 4. Concerns over if there is enough space available in the central reserve on QEII Bridge for pedestrians to wait safely before completing the second crossing. The same could be the case for the uncontrolled crossings on South College Street.	Low Risk	-
Option 2	Potentially feasible, but will require detailed design to fully assess whether: 1. The displacement of the roundabout circulating carriageway provides enough capacity to allow for 2-way cycle lane approaches to the QEII Bridge arm of the junction and a Toucan Crossing, without impacting on the bridge abutments 2. The spiral roundabout design allows sufficient swept paths to facilitate large HGV routing through the freight route 3. The realignment of the roundabout and carriageway construction required may impact utilities and therefore diversionary/protectionary works would be required. Other areas that may impact utilities include the widened footways onto the Queen Elizabeth bridge and the amended traffic islands on all approaches. 4. If there is enough space available in the central reserve on QEII Bridge for pedestrians to wait safely before completing the second crossing. The same could be the case for the uncontrolled crossings on South College Street.	Medium Risk	✖
Option 3	Potentially feasible, but will require detailed design to fully assess whether: 1. The signalised junction layout provides enough capacity to allow for cycle lane approaches to the QEII Bridge arm of the junction and a Toucan Crossing, without impacting on the bridge abutments. 2.The carriageway construction replacing the existing roundabout may impact utilities and therefore diversionary/protectionary works would be required. Other areas that may impact utilities include the widened footways onto the Queen Elizabeth bridge. The amended traffic islands on all approaches and the footway widening on the western side of the existing roundabout. 3. If there is enough space available in the central reserve on QEII Bridge for pedestrians to wait safely before completing the second crossing. The same could be the case for the uncontrolled crossings on South College Street.	Medium Risk	✖
Option 4	Potentially feasible, but will require detailed design to fully assess whether: 1. The signalised junction layout provides enough capacity to allow for cycle lane approaches to the QEII Bridge arm of the junction and a Toucan Crossing, without impacting on the bridge abutments 2. The impact of the banned right turn from Riverside Drive does not significantly adversely impact the junction operation at Riverside Drive / King George VI roundabout or encourage more traffic through the Ferryhill area. 3. The carriageway construction replacing the existing roundabout may impact utilities and therefore diversionary/protectionary works would be required. Other areas that may impact utilities include the widened footways onto the Queen Elizabeth bridge. The amended traffic islands on all approaches and the footway widening on the western side of the existing roundabout. 4. If there is enough space available in the central reserve on QEII Bridge for pedestrians to wait safely before completing the second crossing. The same could be the case for the uncontrolled crossings on South College Street.	Medium Risk	✖

Public Acceptability

Table 35. Public Acceptability

Option	Appraisal	Comments
1	-	Option does not provide any additional benefits to cyclists. Unlikely to be acceptable to Cycle Groups. Option considers a remote crossing on QEII Bridge. Disability groups are unlikely to accept this option
2	✓	Option is considered broadly acceptable to all user groups. There may be some issues for disability groups for the retention of an uncontrolled crossing on South College Street
3	✓✓	Option is considered broadly acceptable to all user groups.
4	✓	Option is considered broadly acceptable to all user groups. There may be some issues for commuters with the banned right turn from Riverside Drive to QEII Bridge, but general traffic restrictions are lower priority within the sustainable hierarchy structure

8.5.4 Note: - Chapter 12 details a subsequent public consultation exercise and update to the appraisal outcome.

Affordability

Table 36. Construction Cost Estimates

Option	Cost Estimate	44% Contingency	Total	Appraisal
1	£287,000	£126,000	£413,000	✓✓✓
2	£690,000	£304,000	£994,000	✓✓
3	£1,357,000	£597,000	£1,954,000	✓
4	£1,357,000	£597,000	£1,954,000	✓

8.5.5 Note: these high level construction cost estimates are for construction costs only, and have been estimated using a combination of industry standard guidance (SPON'S Civil Engineering and Highway Works) and projects of similar scale. A 44% optimism bias uplift has been applied due to the project only being at the concept design stage.

8.6 Summary of Option Appraisal

8.6.1 The Option Generation and Development process (Chapters 6) identified four junction options for appraisal and are detailed in Chapter 7.

8.6.2 The options have been appraised against:

- Study Objectives
- STAG criteria (Environment; Climate Change; Health, Safety & Wellbeing, Economy, Equality & Accessibility)
- Established Policy Directives

- Feasibility, Affordability, and Public Acceptability

8.6.3 Table 37 summarises the appraisal of the four proposed junction improvement options at the South College Street / Riverside Drive / QE Bridge Roundabout.

Table 37. Options Appraisal Summary

Mode	STAG Criteria	Detail	Ranking			
			Option 1	Option 2	Option 3	Option 4
Appraisal Against Study Objectives						
Active Travel	1.1	Reduce walk distance & travel time	✓	✓✓	✓✓✓	✓✓✓
	1.2	Reduce cycle distance & travel time	-	✓✓	✓✓	✓✓
	2	Increase controlled crossing points	✓	✓✓	✓✓✓	✓✓✓
Public Transport	3.1	Futureproof for future PT routes	✖	✖	✓	✓
	3.2	Bus journey times	-	-	✖	✖
General Traffic	4.1	HGV access through the junction	-	-	✓	✓
	4.2	HGV journey routes	-	-	-	-
	5.1	General Traffic Journey Times	-	-	✖	-
	5.2	General Traffic Queue Lengths	-	-	✖	-
Network Resilience	6	Resilience for PT, General Traffic and Emergency vehicles	-	-	✓✓	✓
Appraisal Against STAG Criteria						
Environment	7	Biodiversity, Construction impact, mode shift, air quality	-	✓	✓	✓
Health, Safety & Wellbeing	8	Pedestrian & cycle provisions	✓	✓✓	✓✓	✓✓
Economy	9	Ease of access to the city centre - freight / retail / mode	-	✓	✓	✓
Equality & Accessibility	10	Safe accessibility for all users	✓	✓✓	✓✓	✓✓
Additional Criteria						
Established Policy Directives	11	Alignment with local and national policy objectives	-	✓✓	✓✓	✓✓
Design Risk	12	Design feasibility & risk- TBD	Low	Med	Med	Med
Public Acceptability	13	Anticipated stakeholder response	-	✓	✓✓	✓
Affordability	14	Estimated construction costs	<£500k	<£1m	<£2m	<£2m

8.7 Benefits & Risks Of Options

8.7.1 A summary of the benefits and risks for each option is detailed in the following tables.

Table 38. Option 1 Benefits & Risks

Option	Benefits	Risks
Option 1	- Provides the key missing crossing location for pedestrians (QEII Bridge)	- Does not provide any enhancement to the cycle network
	- Utilises the enhanced cycle network included within the Phase 1 design	- Pedestrians seeking to cross QEII Bridge require to traverse away from the junction (limited footway width on QEII Bridge)
	- Little impact on general traffic queueing or journey times (retains optimum capacity of a roundabout)	- Uncontrolled crossing to remain on South College Street (pedestrian safety issue) Alternative is to include barrier control to restrict this crossing point (which creates new pedestrian safety issues)
	- Provides emergency vehicle access in all directions	- Little scope to provide future bus priority
	- Minimal construction Intervention (Low cost and construction impact)	- Freight movements to the Harbour unaffected - not necessarily a positive, as longer HGVs required to navigate round a relatively small roundabout
	- Low risk to feasibility for construction	- Does not enhance control of the junction performance to flush through extended queues on a particular arm (for network resilience)
		- Unlikely to gain much public acceptability due to limited additional active travel provisions
		- Does not follow the latest policy objectives to prioritise active travel over vehicular movement

Table 39. Option 2 Benefits & Risks

Option	Benefits	Risks
Option 2	- Provides the key missing crossing location for pedestrians (QEII Bridge)	- Potential detailed design risks to fit a spiral roundabout in with a Toucan crossing across the face of QEII Bridge
	- Provides key cycle connection to North Esplanade West at the junction (via Toucan crossing at QEII Bridge)	- Uncontrolled crossing to remain on South College Street (pedestrian safety issue) Alternative is to include barrier control to restrict this crossing point (which creates new pedestrian safety issues)
	- Little impact on general traffic queueing or journey times (retains high capacity of a roundabout)	- Little scope to provide future bus priority
	- Provides emergency vehicle access in all directions	- Freight movements to the Harbour unaffected - not necessarily a positive, as longer HGVs required to navigate round a relatively small roundabout
	- Performs generally well against the latest policy objectives to prioritise active travel over vehicular movements	- Does not enhance control of the junction performance to flush through extended queues on a particular arm (for network resilience)
		- Potential limited public acceptability due to retention of uncontrolled crossing
		- Unfamiliarity for Aberdeen Drivers of a spiral roundabout design - driver safety risks

Table 40. Option 3 Benefits & Risks

Option	Benefits	Risks
Option 3	- Provides the key missing crossing location for pedestrians (QEII Bridge)	- Some impact to general traffic queueing / journey times due to natural delays incurred within a signalised junction design. Potential delays minimalised due to a combination of walk-with and remote pedestrian crossings at the junction. Higher delays than Option 4, due to a 4 stage signalised junction
	- Provides key cycle connection to North Esplanade West at the junction (via Toucan crossing at QEII Bridge)	- Some detailed design risks to fit Toucan across the face of QEII Bridge.
	- No uncontrolled crossing points proposed	- Signalised junction may create platooning effect of vehicles routing SB on
	- Scope to provide future bus priority via hurry call / transponder opportunities	
	Provides emergency vehicle access in all directions	
	- Network Resilience - Allows control of the junction to flush through any extended queues on a particular arm that may occur at peak times/during network incident	
	- Freight movements to the Harbour potential easier due to the removal of the roundabout to allow for wider swept paths (particularly from QEII Bridge to North Esplanade West)	
	Performs generally well against the latest policy objectives to prioritise active travel over vehicular movements	
	- Signalised junction could potentially provide additional road space for enhanced biodiversity	
	- Option is considered broadly acceptable to all user groups	

Table 41. Option 4 Benefits & Risks

Option	Benefits	Risks
Option 4	- Provides the key missing crossing location for pedestrians (QEII Bridge)	- Some impact to general traffic queueing / journey times due to natural delays incurred within a signalised junction design. Potential delays minimalised due to a combination of walk-with and remote pedestrian crossings at the junction. Lower delays than Option 3, due to a 3 stage signalised junction
	- Provides key cycle connection to North Esplanade West at the junction (via Toucan crossing at QEII Bridge)	- Potential for rat-running vehicles to route through Ferryhill to avoid the banned right turn from Riverside Drive
	- No uncontrolled crossing points proposed	- Some detailed design risks to fit Toucan across the face of QEII Bridge.
	- Scope to provide future bus priority via hurry call / transponder opportunities	- Emergency vehicle may incur a delay in routing from Riverside Drive to Anderson Drive / Torry area
	Network Resilience - Allows control of the junction to flush through any extended queues on a particular arm that may occur at peak times/during network incident	- There may be some acceptability issues for commuters with the banned right turn from Riverside Drive to QEII Bridge
	- Freight movements to the Harbour potential easier due to the removal of the roundabout to allow for wider swept paths (particularly from QEII Bridge to North Esplanade West)	
	- Performs generally well against the latest policy objectives to prioritise active travel over vehicular movements	
	- Signalised junction could potentially provide additional road space for enhanced biodiversity	
	- Option is considered broadly acceptable to all user groups	

9. FURTHER DESIGN REFINEMENT:

ACTIVE TRAVEL PROVISIONS ON NORTH ESPLANADE WEST

9.1 General

9.1.1 Following the outcomes from the option appraisal process detailed in Chapter 8, ACC advised that Options 3 and 4 (signalised junction options) should be taken forward for further refinement.

9.1.2 ACC requested that both design options consider additional active travel provision to and through the western footway of North Esplanade West (between South College Street and Palmerston Road). This includes Toucan crossing provisions across the southern end of South College Street – See Figure 33.

Figure 33. Location of Additional Active Travel Access Requirements

9.1.3 The cycle route along the Riverside of North Esplanade West would be considered the main cycle and pedestrian routing path with the western footway provided for access into the Business quarter and through to Union Square.

9.1.4 Following a review of the carriageway and footway widths, the high level engineering designs for Option 3 and Option 4 were amended to include a shared footway for pedestrians and cyclists along the length of the western footway of North Esplanade West between South College Street and Palmerston Place. This can be seen in the updated drawings for Option 3 and 4 in Figure 34 and Figure 35 respectively

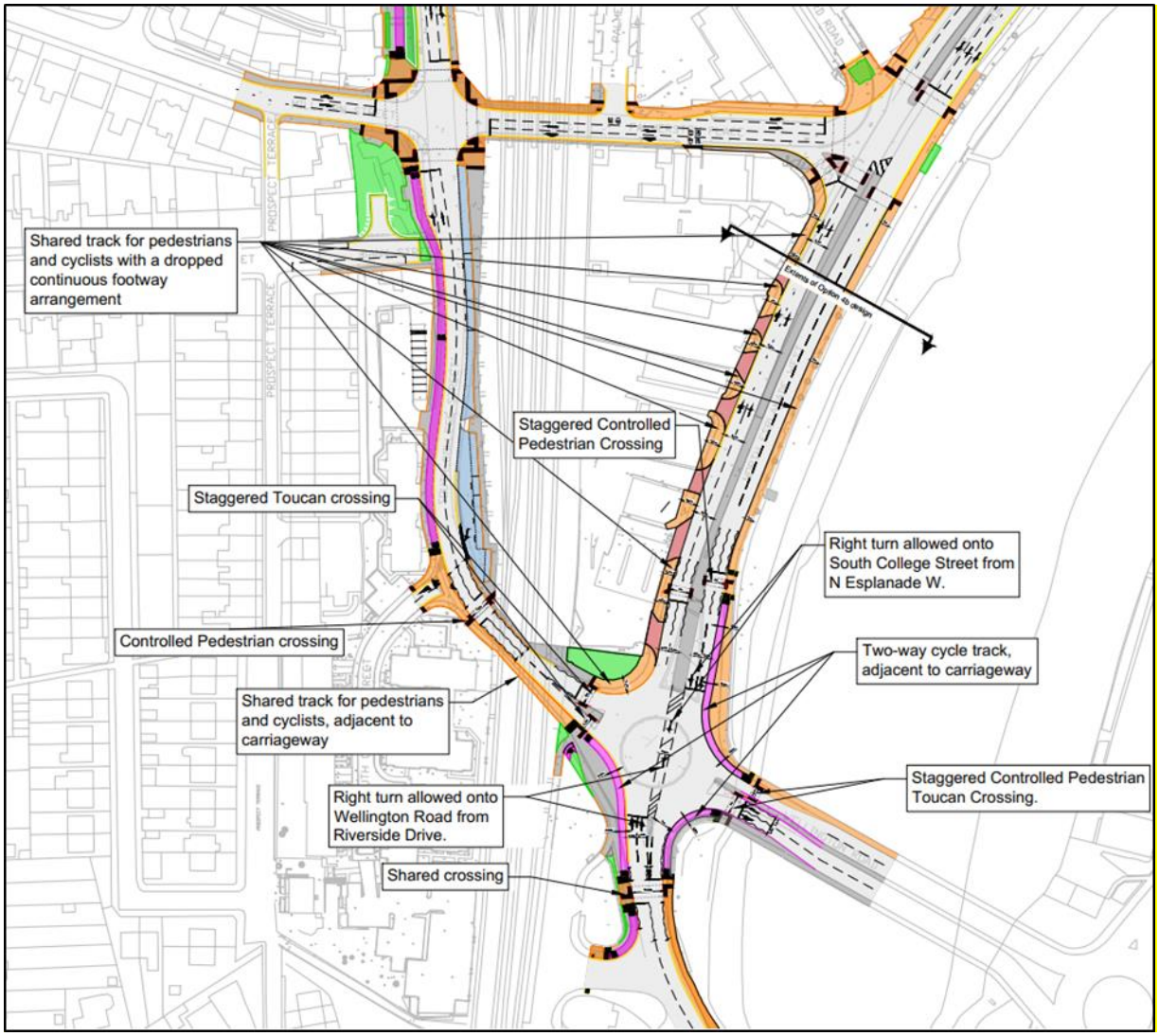


Figure 34. Updated Option 3

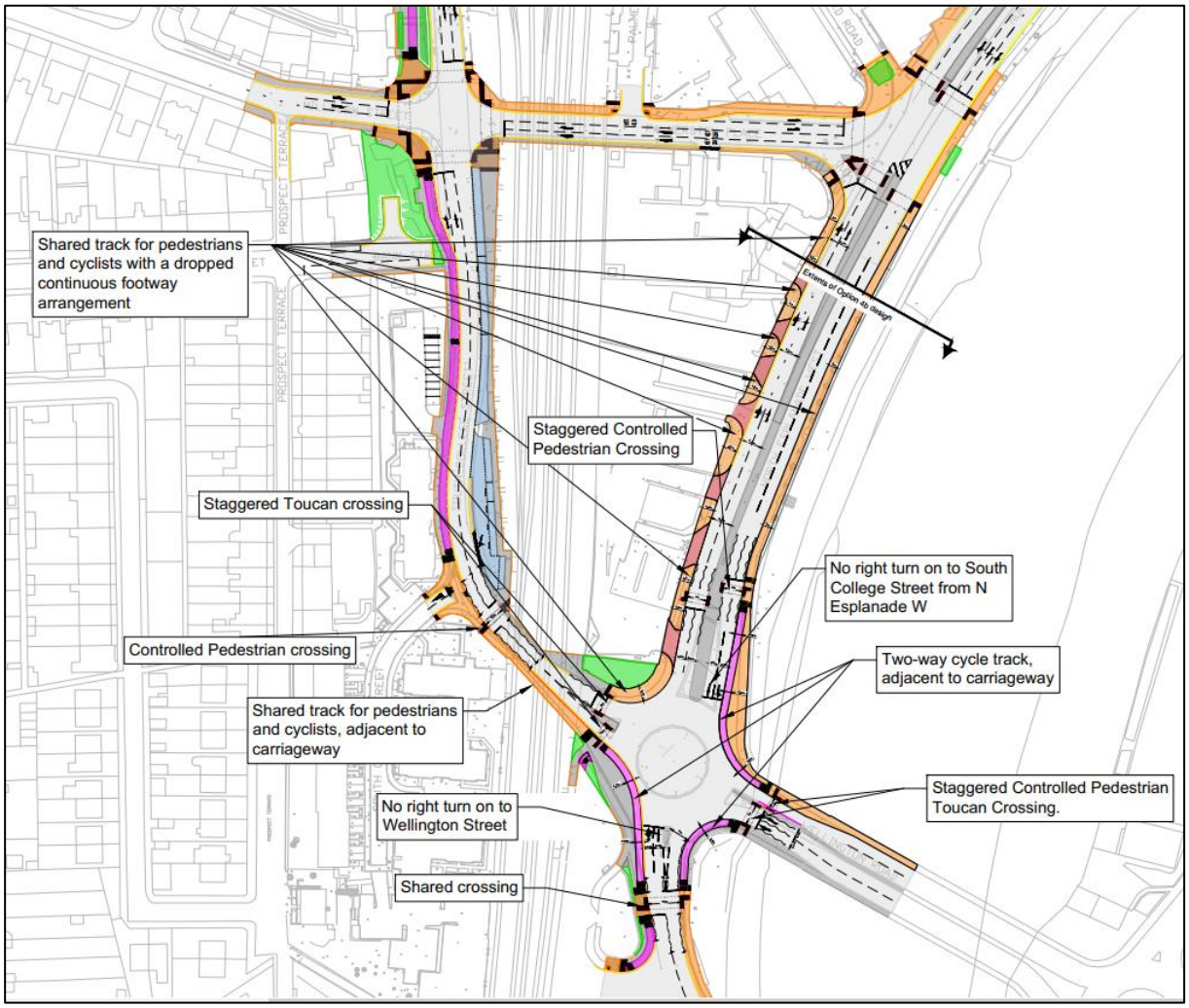


Figure 35. Updated Option 4

9.1.5 The footway provisions on the west side of North Esplanade West will vary in width from a minimum of 2.5m (in line with Cycling by Design 2021) to 3.5m locally where this can be achieved.

9.1.6 The footway/track itself includes a series of drop kerbs for each of the accesses along this section of the corridor. The shared pedestrian / cycle footway will be continuous across the accesses with a dropped kerb arrangement (driveway style access) to enable continuous movement for cyclists and priority for active travel along the track.

9.1.7 These figures have been developed to a high level concept design stage. A final option will be subject to full and detailed design standards.

9.1.8 The impact of the additional active travel considerations for Option 3 and Option 4 enhances walking and cycling provisions through the area by facilitating:

- Walking and cycling provisions along both sides of North Esplanade West between QE Bridge and Palmerston Place
  - Active travel routing along the Riverside
  - Active travel access to properties along the west of North Esplanade (business quarter) and through to Union Square

- Controlled crossing provisions on all arms of the QE Bridge / South College Street Junction
- Controlled crossing provisions on all arms of the Palmerston Place / North Esplanade West junction.

10. SENSITIVITY TESTING – SOUTHERN QUEEN ELIZABETH BRIDGE JUNCTION

10.1 Introduction

10.1.1 The relatively close proximity (140m) of the two junctions at either end of QE Bridge was highlighted as a potential traffic progression issue by ACC. Traffic progression across the Bridge could potentially be hindered if one junction operates under signal control whilst the other remained as a priority roundabout – See Figure 36.

10.1.2 For this reason, ACC requested that SYSTRA undertake a sensitivity test for the potential signalisation of the QE Bridge/Wellington Rd/Craig Pl junction (Southern QE Bridge junction) to assess if this provided any benefit to traffic progression across QE Bridge.

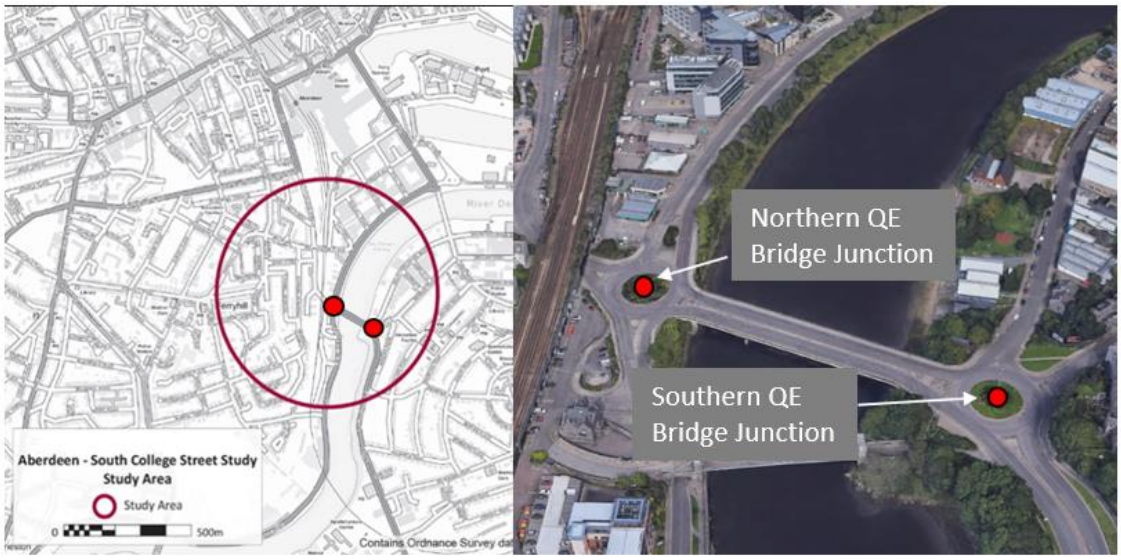


Figure 36. Wider Study Area

10.1.3 It is important to note that ACC are fully aware of the need to also review active travel connections around the Southern QE Bridge roundabout and at the southern end of the Wellington Suspension Bridge. However, improvements for active travel around these junctions could potentially be considered remotely from the roundabout itself. It was therefore considered important to ACC to understand if the signalisation of the southern roundabout provided any other transport benefits to the network beyond active travel, especially considering the significant costs associated with full signalisation of this junction.

10.1.4 ACC were keen to stress that a signalised design for the southern junction should only be considered at a high level at this point. If traffic modelling suggests a significant benefit to traffic progression and operation across QE Bridge, then designs could progress towards a more detailed consideration for all modes, as per Option 3 and 4 for the northern junction.

10.2 Southern QE Bridge Junction Design

10.2.1 A concept design for the signalised Southern QE Bridge junction was developed by reviewing the geometry of the available area together with the lane requirements derived from traffic demand turning flows extracted from the traffic model. A high level concept junction design is shown in Figure 37. This layout was applied in the traffic modelling.

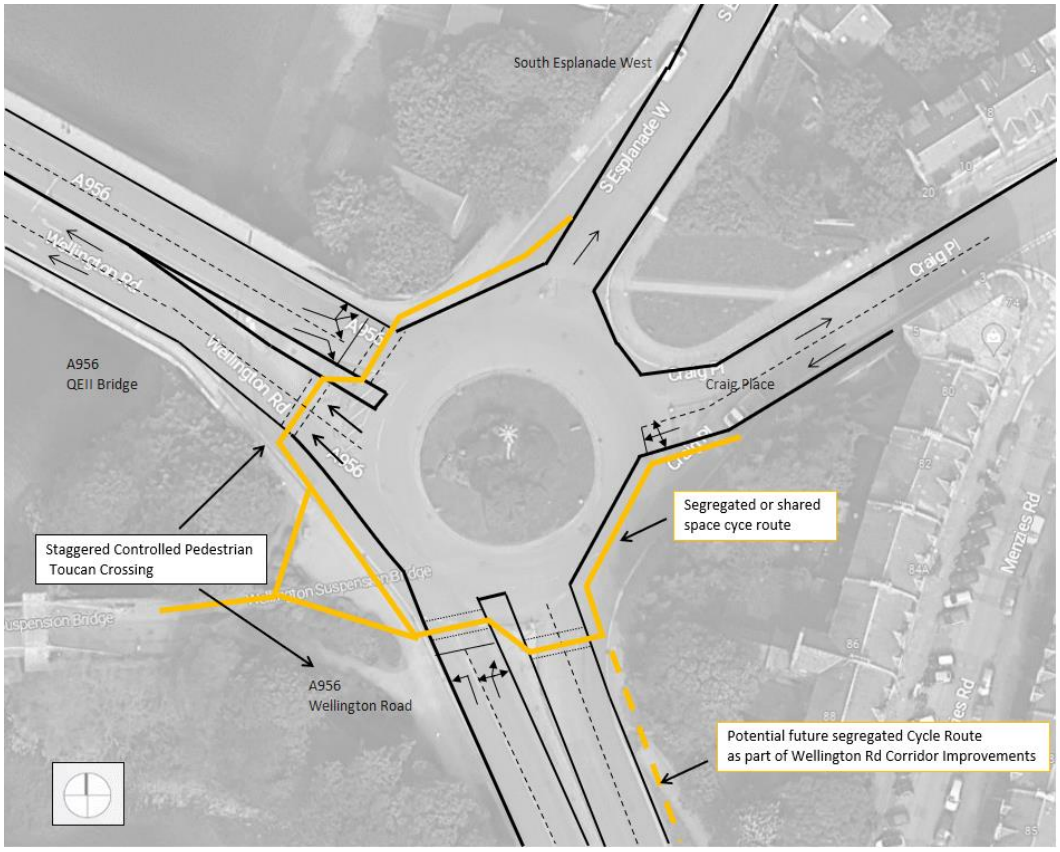


Figure 37. Southern QE Bridge - High Level Concept Junction Design

10.2.2 The signal phasing used in the concept design is shown in Figure 38.

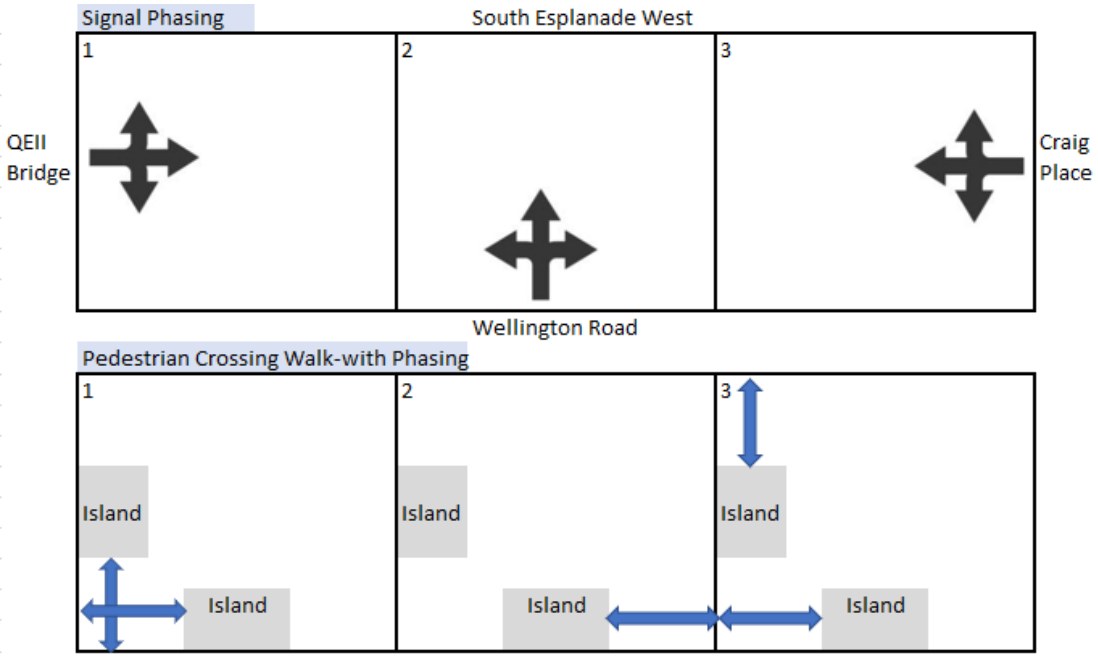


Figure 38. Southern QE Bridge Concept Junction Phases

10.2.3 The signal phasing allows for an efficient walk-with pedestrian crossing, with controlled crossing provided on QE Bridge and Wellington Road. It is assumed that the low traffic

volumes on Craig Place and South Esplanade West negate the requirement for an at-junction controlled crossing. A remote crossing could be considered on these arms through a more detailed junction design exercise.

10.2.4 The signal timings used for the concept junction design were determined based on peak hourly traffic flows for the AM, Interpeak, and PM periods for Option 3 and Option 4.

10.2.5 The signal timings were offset to prioritise the predominant movement over the QE Bridge in each peak. This was undertaken to minimise queuing on the bridge.

10.3 Traffic Model Outputs

10.3.1 To incorporate the proposal at the Southern QE junction, the following new model scenarios are as follows:

- Option 3B –Northern QE Bridge (as per Option 3) and Southern QE Bridge Signalised as above.
- Option 4B –Northern QE Bridge (as per Option 4) and Southern QE Bridge Signalised

10.3.2 To allow for model comparisons of the above proposals, 5 scenarios are detailed in the following model assessment, as summarised in Table 42.

Table 42. Model Testing Scenarios

	Test Scenarios				
Infrastructure	Ref Case	Option 3	Option 3B	Option 4	Option 4B
South College Street Phase A works	✓	✓	✓	✓	✓
Signalisation of Northern QEII Bridge Junction: All turning movements allowed		✓	✓		
Signalisation of Northern QEII Bridge Junction: Banned R/T on North Esplanade West and Riverside Drive				✓	✓
Signalisation of Southern QEII Bridge Junction			✓		✓

10.3.3 To assess the operation of the Southern QE Junction, modelled queue length comparisons were undertaken for each scenario on each approach arm, as shown in Figure 39. To be explicitly clear, the three modelled queue routes end at the point of crossing the Southern QE Bridge junction stop line.

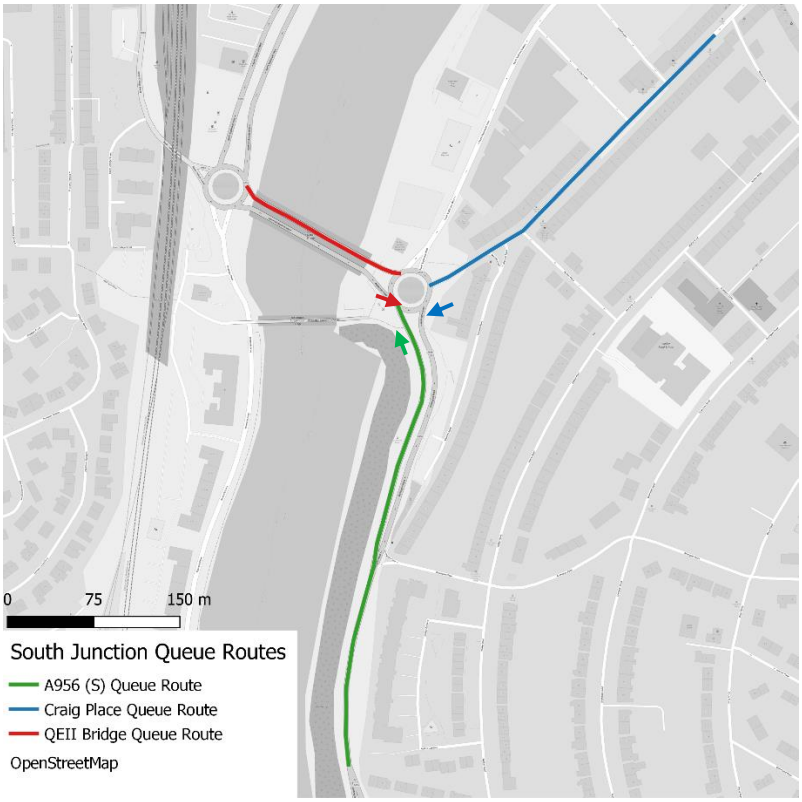


Figure 39. Queue Routes on Approach to the South Junction

10.3.4 Figure 40 presents the average modelled queue length (m) on QE Bridge on approach to the southern QE Bridge junction. The 'Bridge Extent' dotted line represents the length of the QE Bridge itself from the junction stop line.

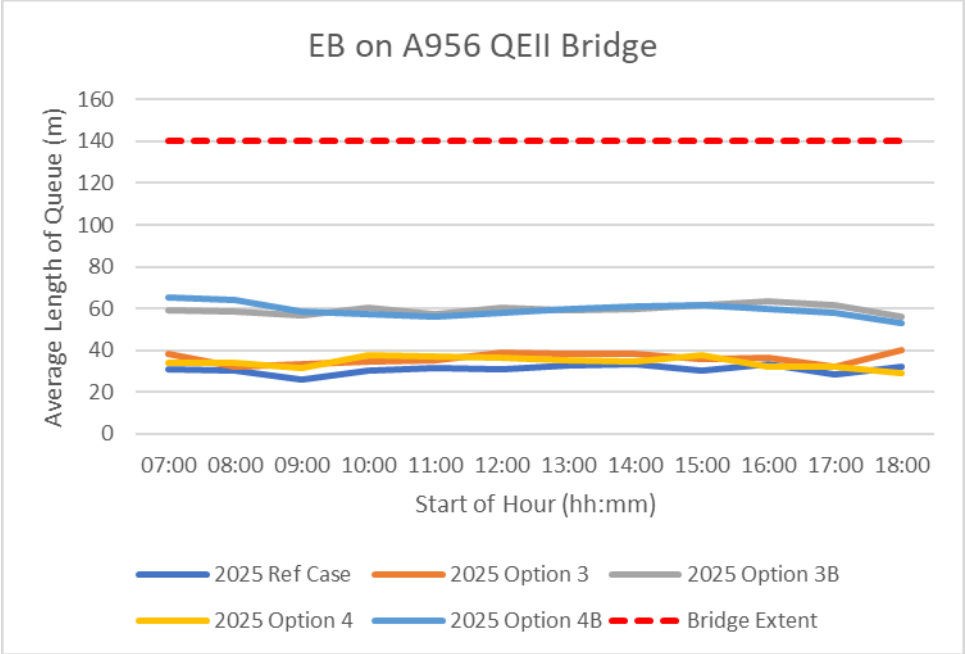


Figure 40. Average Queue Length (m) EB on A956 QE Bridge(Southern Junction)

10.3.5 For eastbound traffic on QE Bridge, the signalised options 3B and 4B (with both QE Bridge junctions signalised) have a very similar queueing profile as the Options 3 and 4, but with a

higher average level of queuing. This additional queueing is primarily due to the natural delays associated with a traffic signal junction (e.g. intergreen period).

10.3.6 The level of eastbound queueing suggested by the modelling is clearly within the Bridge extent. Therefore, the signalisation of the southern QE Bridge roundabout does not appear to offer any significant benefit to traffic progression in this direction, nor does it require to.

10.3.7 Figure 41 presents the average modelled northbound queue length on the A956 Wellington Road approach to the southern QE Bridge junction.

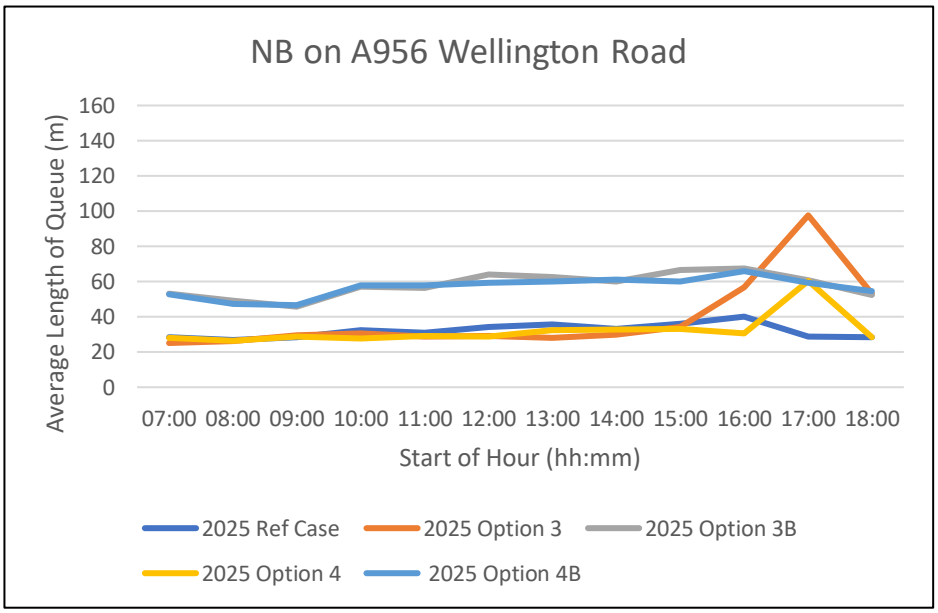


Figure 41. Average Queue Length (m) EB on A956 Wellington Road

10.3.8 For Options 3 and 4, there is a peak in queuing in the PM period between 4pm and 6pm. This is actually a northbound queue at the northern QE Bridge junction, propagating back across the bridge and through the southern junction.

10.3.9 With the signalisation of the southern QE Bridge roundabout, this queue peak does not occur. The junction signalisation enables a flatter, more consistent queue profile, albeit at a higher level in Options 3B and 4B compared to Options 3 and 4.In general, whilst the northbound queue peak is flattened with the signalisation of the Southern QE Bridge Roundabout, the overall queuing throughout the model period on Wellington Road is approximately 50% higher in Option 3B compared to Option 3 and 75% higher in Option 4B compared to Option 4.

10.3.10 These results suggest that the signalisation of the Southern QE Bridge junction has a more significant detrimental impact on overall queuing on Wellington Road compared to the benefit of more consistent queue levels throughout the day.

10.3.11 Figure 42 presents the average modelled length of the queue on Craig Place on approach to the southern QE Bridge junction.

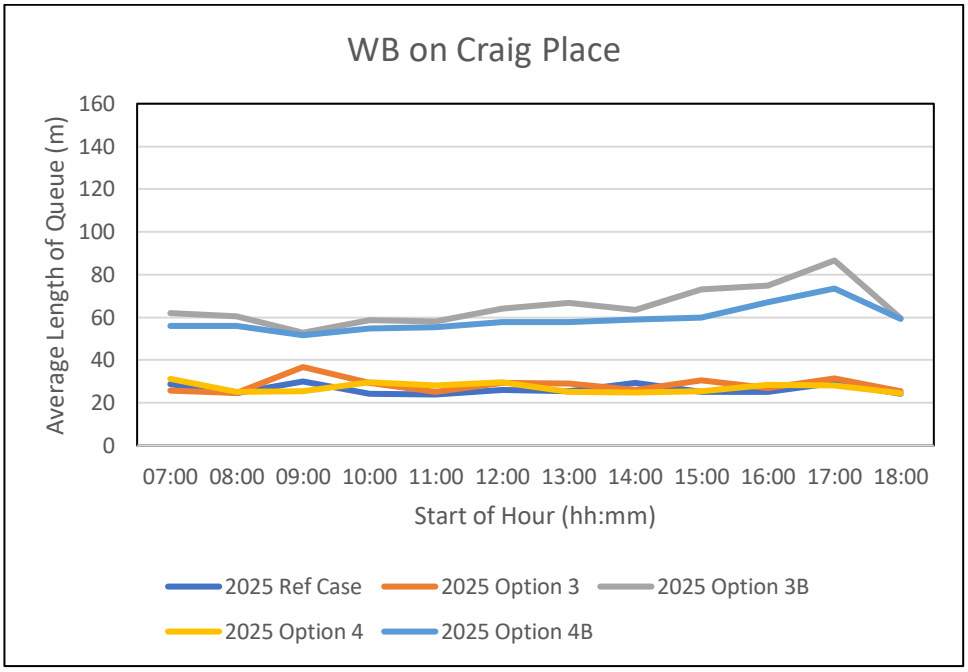


Figure 42. Average Queue Length (m) EB on Craig Place

The results suggest a similar queue pattern to the QE bridge eastbound queue, with a higher average level of queuing due to the natural delays associated with a traffic signal junction in the 'B' options.

10.4 Summary

10.4.1 The modelling suggests that, whilst the signalisation of the southern QE Bridge junction provides more control over egress through the junction, the positive impact to overall progression of traffic across the Bridge is minimal. The northern QE Bridge junction is the predominant junction that dictates the level of traffic throughput across the bridge (due to the high traffic demand from all four approach arms).

10.4.2 The signalisation of the southern QE bridge junction reduces the peak queuing in the PM peak period on Wellington Road, but the overall queuing on all arms of the junction is higher than with the roundabout, due to the natural delays that occur through traffic signalisation (e.g. intergreen periods). This is despite a highly efficient 3-stage signal phasing provision with walk-with pedestrian crossing provisions.

10.4.3 There would be significant benefits to active travel provisions if the Southern QE Bridge junction was signalised, and should be accounted for in any wider appraisal of the junction (outside the scope of this sensitivity testing). The current uncontrolled crossing provisions are insufficient for pedestrians and also for cyclists routing between Wellington Road, South Esplanade West (National Route 1) and across the Wellington suspension Bridge.

10.5 Alternative Options

10.5.1 It is worth reiterating that the Wellington Road Corridor Improvement proposals (See Section 3.3) include enhanced northbound bus route provisions and a segregated cycleway on the east side of the carriageway. These proposals stop short of the Southern QE Bridge junction itself.

10.5.2 There may therefore be alternative considerations for active travel improvements at this location without the need for full signalisation of the junction. For example, a bus gate on

Wellington Road on approach to the Southern QE Bridge junction, would allow bus priority over the northbound general traffic queue. This bus gate could include traffic signals that also allow a pedestrian crossing phase (toucan crossing). This would therefore allow the cycle lane on Wellington Road to connect with the Wellington Suspension Bridge. Widened footways along the east side of the junction would allow cycle connection between Wellington Road and South Esplanade West (with consideration for remote Toucan crossings)

10.5.3 Considering the potential cost to signalise the Southern QE Bridge junction, SYSTRA would therefore recommend that alternative active travel improvement measures are investigated further to ensure that measures considered at this location provide the most efficient and cost effective solution.

11. RIVERSIDE DRIVE - ACTIVE TRAVEL IMPROVEMENT OPTIONS

11.1 Introduction

11.1.1 As detailed in Section 2.4, adjacent to the QE Bridge Northern junction is a road narrowing section under the Wellington Suspension Bridge on Riverside Drive . The footway on the east side of the Bridge is currently 1.9m wide and 1.1m wide on the west side – See Figure 43.

Figure 43. Road & Footway narrowing Under Wellington Suspension Bridge

11.1.2 A shared pedestrian and cycle route is currently provided on Riverside Drive south of the Suspension Bridge and parallel to the River Dee.

11.1.3 The South College Street Phase 1 improvements include some minor measures to improve active travel through this narrowing section of Riverside Drive. This includes a re-alignment of the northbound approach shared walking & cycle lane on the east side of Riverside Drive- See Figure 45.

11.1.4 This path re-alignment allows for greater visibility for pedestrians and cyclists on approach to the narrowed footway to enable the footway to operate as single file through the archway, through a courtesy give-way operation. To further clarify this proposed operation, a sign has been erected on the north-east side of the footway to advise cyclists and pedestrians of the proposed routing operation - See Figure 44.

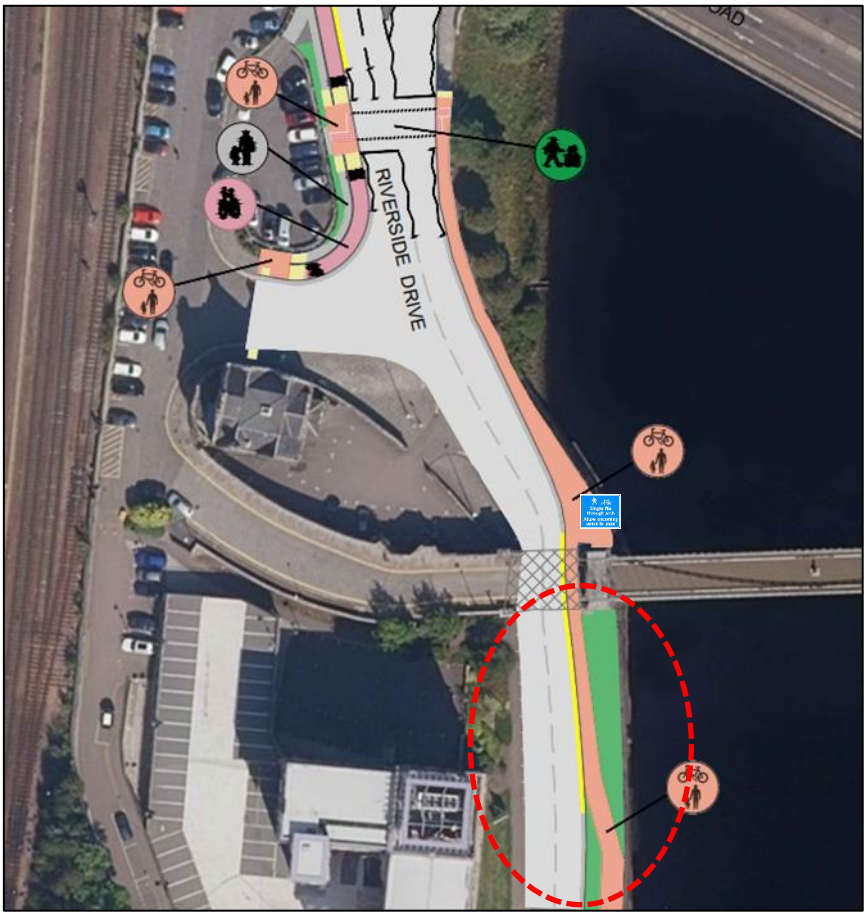


Figure 44. Phase 1 Works – Footway Re-alignment

Figure 45. New Advisory Signage on southbound approach to Wellington Suspension Bridge

11.2 Further Active Travel Improvement Considerations

11.2.1 ACC requested that SYSTRA review the measures for walking and cycling through this section of Riverside Drive, including the additional measures implemented as part of the South College Street Phase 1 works noted above, and consider if any further measures to improve active travel could be developed. In particular, ACC highlighted the following issues:

- The footways under the Wellington Road Suspension Bridge are below standard (minimum 3m in 'Cycling by Design') for two-way cycling (1.9m on east side, 1.1m on west side), hence the need to warn users to allow for oncoming pedestrians or cyclists.

- The footway on the east side of Riverside Drive, between the Suspension Bridge and QE Bridge is also below standard width for two way cycling plus pedestrian routing.

11.2.2 SYSTRA considered a series of broad concept options to further improve active travel provisions under the Wellington Suspension Bridge. Table 43 details the options considered.

Table 43. Riverside Drive – Additional Active travel Considerations

Riverside Drive Active Travel Improvement Options	Detail	Feasibility	Comment
1 Do Nothing	Leave operation as per Phase 1 measures	Partial	Cyclists would potentially require to dismount when routing on the east side of Riverside Drive, between Wellington Bridge and QEII Bridge
2 Do Minimum	Widen Footway on Riverside Drive, between QEII Bridge and Wellington Suspension Bridge	Yes	Still allows cycle and pedestrian movement along Riverside Drive with extra caution required under Wellington Suspension Bridge. This is a potential option if other more invasive considerations are not feasible
3 Give Way Priority Junction under Suspension Bridge	Give -way to oncoming traffic' signage with priority junction shuttle working under Wellington Suspension Bridge	No	Give-way operation requires Stopping Sight Distance of 70m. Visibility through the junction is far below the standard required.
4 Riverside Drive - One Way Operation	Riverside Drive to operate either one way eastbound or westbound between QEII Bridge and King George VI Bridge. Allows for a single road lane under Wellington Suspension Bridge with footway widening	No	Highly likely that this proposal would have a signficant impact on parallel rroad corridors - particularly through the Ferryhill area.
5 Signalised Shuttle Working	One-way signalised shuttle working under Wellington Suspension Bridge. Allows for a single road lane configuration and footway widening under the bridge	Yes	Traffic Signal shuttle working is viable but may impact on operation of QEII Brudge / South College St signalised junction. Traffic modelling of scenario suggested

11.2.3 From the above considerations, two potential scenarios were derived:

- Do-Minimum
  - Widen the east footway on Riverside Drive, north of the Suspension Bridge to facilitate improvements for walking and cycling and connection to the Toucan crossing at the north of Riverside Drive and the proposed toucan crossing on QE Bridge (associated with QE Bridge Northern junction Options 3 and 4).
  - Under the Wellington Suspension Bridge, leave the footways at the current width and retain the signage detailed in Figure 45. Potentially include a similar sign on the northbound approach
- Signalised Junction Shuttle Working
  - Signalised junction through the archway of the Wellington Suspension Bridge to limit traffic to one lane. This enables footway widening under the suspension bridge so a shared walking and two way cycle lane can operate to standard (Cycling by design).
  - Footway widening on Riverside Drive, as per the Do-minimum scenario, would also be included.

11.2.4 The Do-Minimum and Shuttle working options have been developed to high-level design drawings, as detailed in Figure 46 and Figure 47

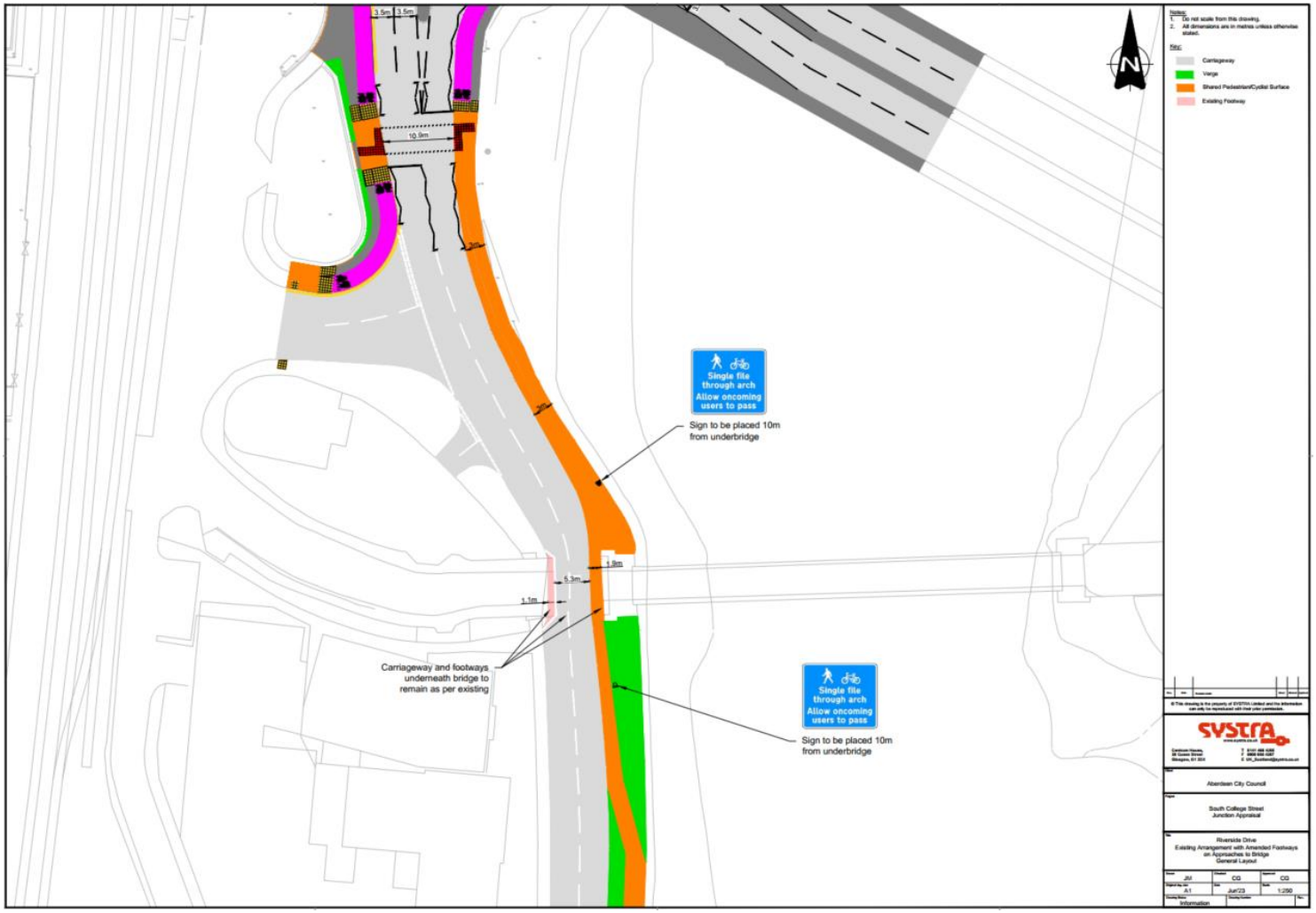


Figure 46. Riverside Drive - Do-Minimum Scenario

Figure 47. Riverside Drive – Signalised Shuttle Working

11.3 Riverside Drive - Signalised Shuttle Working Option

11.3.1 The shuttle design takes into account the proposed pedestrian and cycle path widening and signal stoplines, as shown by the proposed road design in Figure 47. Vehicle swept path analysis has been undertaken to derive the required vehicle stopline position for both the northbound and southbound approaches – as shown in Figure 48.

Figure 48. Riverside Drive - Shuttle Working Design Swept Paths

11.3.2 The swept path analysis suggests the junction stoplines require to be approximately 35m apart to enable a smooth transition for HGV Rigid vehicles through the junction.

11.3.3 The single traffic lane under the Wellington Suspension Bridge allows for a 3m pedestrian and cycle path under the suspension Bridge on the eastern footway. This connects to the Toucan crossing further north on Riverside Drive and also to the proposed Toucan Crossing on QE Bridge (as part of Options 3 and 4) via a widened footway.

11.3.4 The resultant layout enables a continuous pedestrian and footway link, connecting North Esplanade West with Riverside Drive along the waterfront.

11.3.5 To assess the wider impact and potential feasibility of the shuttle working design, ACC requested that SYSTRA undertake traffic modelling of this option.

11.4 Traffic Modelling of Riverside Drive Shuttle Working

11.4.1 The proposed shuttle signal junction design is composed of two signal phases with appropriate intergreen time (calculated from the proposed vehicle stop line distances) and green time determined by peak hourly model flows for the AM, IP and PM periods

11.4.2 The signal timings were offset to prioritise the SB movement to minimise queuing between the northern QE Bridge junction and the shuttle signals.

11.4.3 To assess the traffic operation of the design, average traffic queue levels were extracted from the traffic model on both approaches to the junction - as detailed in Figure 49.

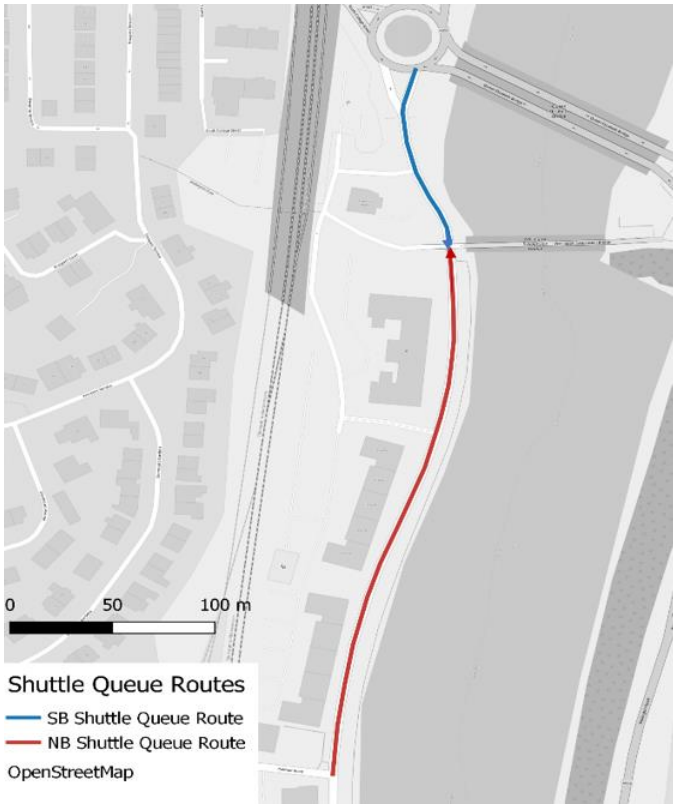


Figure 49. Queue Routes on Approach to Shuttle Signals

11.4.4 The new model scenarios used in the sensitivity tested are:

- Option 3C – Northern QE Bridge Signalised (as per Option 3) with Riverside Drive Shuttle Signals
- Option 4C – Northern QE Bridge Signalised (as per Option 4) with Riverside Drive Shuttle Signals

11.4.5 There are therefore 5 scenarios detailed in the following model assessment as summarised in Table 44.

Table 44. Model Testing Scenarios

	Test Scenarios				
Infrastructure	Ref Case	Option 3	Option 3C	Option 4	Option 4C
South College Street Phase A works	✓	✓	✓	✓	✓
Signalisation of Northern QEII Bridge Junction: All turning movements allowed		✓	✓		
Signalisation of Northern QEII Bridge Junction: Banned R/T on North Esplanade West and Riverside Drive				✓	✓
Riverside Drive Shuttle Working Signals			✓		✓

11.4.6 Figure 50 presents the average modelled southbound queue length on approach to the shuttle signals on Riverside Drive. The dotted 'Max Length' line represents the distance between the northern QE Bridge junction and the SB shuttle signals stop line.

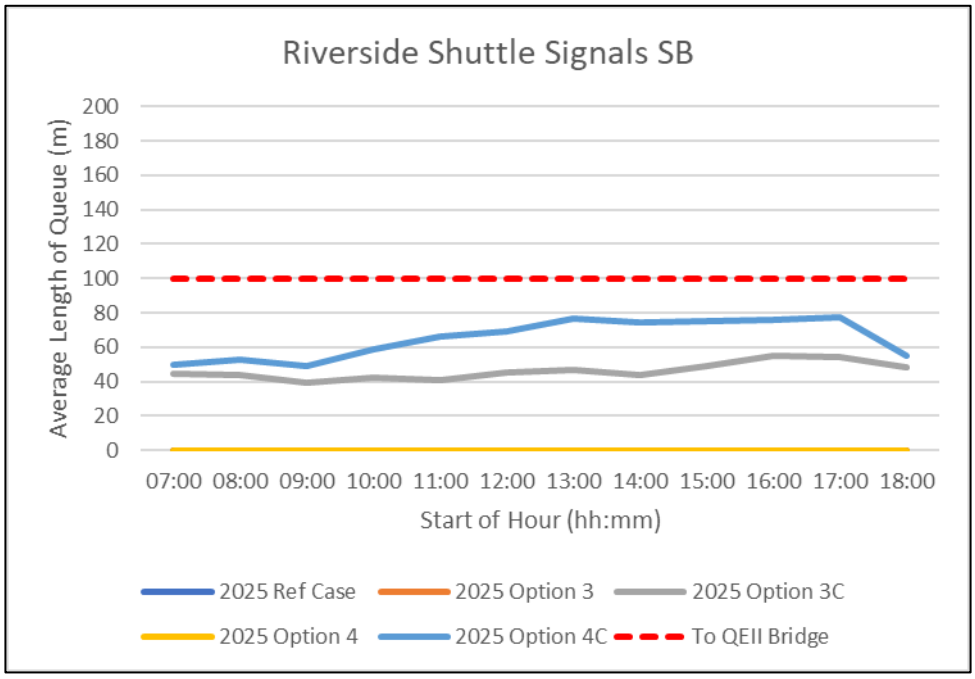


Figure 50. Average Southbound Queue Length on approach to Riverside Drive Shuttle Signals

11.4.7 The Reference Case, Option 3 and Option 4 do not have any southbound traffic queuing, as the southbound approach to the Wellington Suspension Bridge operates in free flow conditions in these scenarios.

11.4.8 The queue profile of the two scenarios with shuttle-working included (Scenarios 3C & 4C) suggests that while queuing occurs (due to the natural delays associated with a traffic signal junction), the average queue does not reach back to the northern QE Bridge junction, as shown by the dotted red line.

11.4.9 The level of traffic queuing is higher in Option 4C than Option 3C. This is potentially due to the alignment of signal timing phases between the norther QE Bridge junction and the shuttle working signals being less conducive to smooth operation in Option 4, specifically related to southbound queueing.

11.4.10 Figure 51 presents the average modelled northbound queue length on approach to the shuttle signals on Riverside Drive .

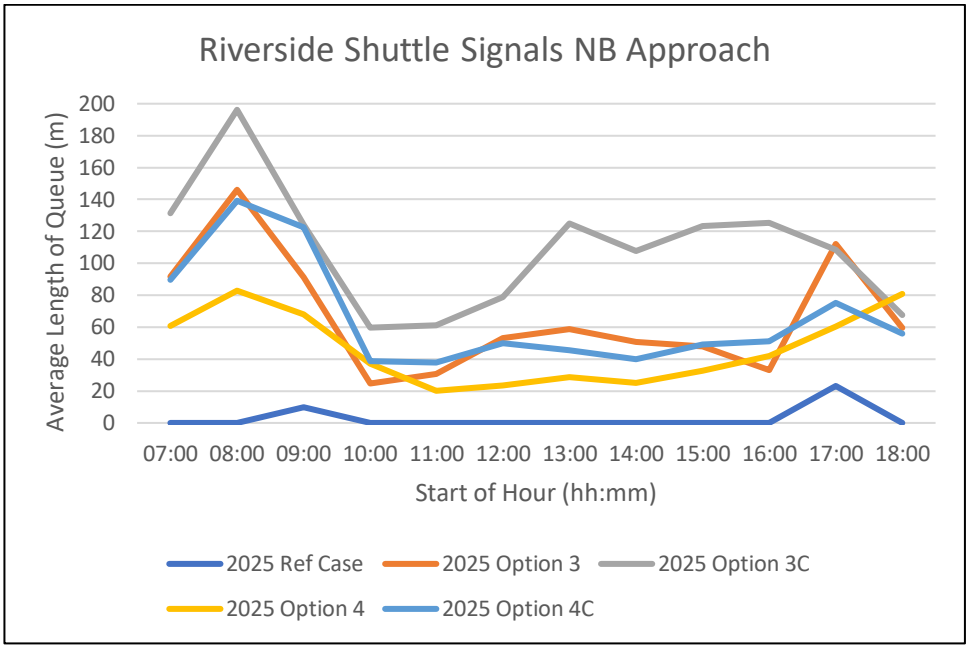


Figure 51. Average Northbound Queue Length on approach to Riverside Drive Shuttle Signals

11.4.11 The graph shows that there is already occasional northbound traffic queuing back from the QE Bridge junction on Riverside Drive under the Option 3 and 4 scenarios (Signalisation of QE Bridge northern junction). This queue traverses under the Suspension Bridge and is picked up by the queue graph above.

11.4.12 The queue analysis suggests that the shuttle-working signals further increase the level of queuing that already occurs in the non-shuttle options.

11.4.13 This is most apparent in the AM peak hour, which has the highest hourly northbound flow resulting in an increase in an average of 60m for both Option 3C and Option 4C.

11.4.14 However, that is not the complete story. It is important to clarify that that the observed longer northbound traffic queue back from the Suspension Bridge signals is not necessarily in addition to the queue back from the QE Bridge junction itself. Queue gaps are created between these two traffic signals for northbound traffic. The signal offsets were developed to prioritise the southbound movement under the Suspension Bridge so that southbound queueing didn't tail back to the QE Bridge junction and impact on the junction operation. This results in some inefficiency in the progression of traffic northbound through the two sets of traffic signals. If this design option was carried forward into detailed design, it may be pertinent to utilise LinSig modelling to develop the optimum offset between the two sets of traffic signals.

11.4.15 The queuing in Option 3C is higher than Option 4C due to Option 3C maintaining the right turn movement from Riverside Drive to QE Bridge, which has a higher northbound traffic flow and poorer alignment with the northern QE Bridge junction signal phases/timings.

11.4.16 Ultimately, the model testing suggests that the consideration of signalised shuttle-working traffic signals on Riverside Drive is feasible. The benefits are related to wider pedestrian and cycle footways under the Wellington Road suspension Bridge, which currently do not meet design standards. The dis-benefits are that there may be some degree of additional queueing on Riverside Drive routing eastbound towards QE Bridge.

11.4.17 It is important to note that Riverside Drive does not have a primary or secondary route function within the Aberdeen Roads Hierarchy network. Therefore, priority for traffic movements must be given to QE Bridge, South College Street and North Esplanade West.

11.4.18 It is also important to note that any increase in delay for drivers on Riverside Drive may inadvertently force routing traffic to divert through the Ferryhill residential area.

11.5 Enhanced Consideration of Riverside Drive Shuttle Working Scenario

11.5.1 As detailed in Section 11.4, the consideration of signalised shuttle working allows for a wider pedestrian and cycle footway on the east side of Riverside Drive. On the west side, there is still a very narrow 1.1m footway in place (See Figure 47), which is below design standards for both pedestrians and cyclists).

11.5.2 ACC have highlighted that there may be further opportunity to utilise the potential shuttle-working signalisation at the Wellington Suspension Bridge to also provide a pedestrian/toucan crossing at this location. The controlled crossing would be incorporated into the signal phasing for the shuttle working signals.

11.5.3 A controlled crossing would enable pedestrians and cyclists on the west side of Riverside Drive to cross to the east side and avoid the narrow 1.1 footway under the suspension Bridge.

11.5.4 SYSTRA have developed this concept into a high level design drawing as shown in Figure 52.

11.5.5 Further detailed design may consider the complete closure of the narrow 1.1m footway under the suspension bridge with associated barriers to guide pedestrians and cyclists across the Toucan Crossing to the east path.

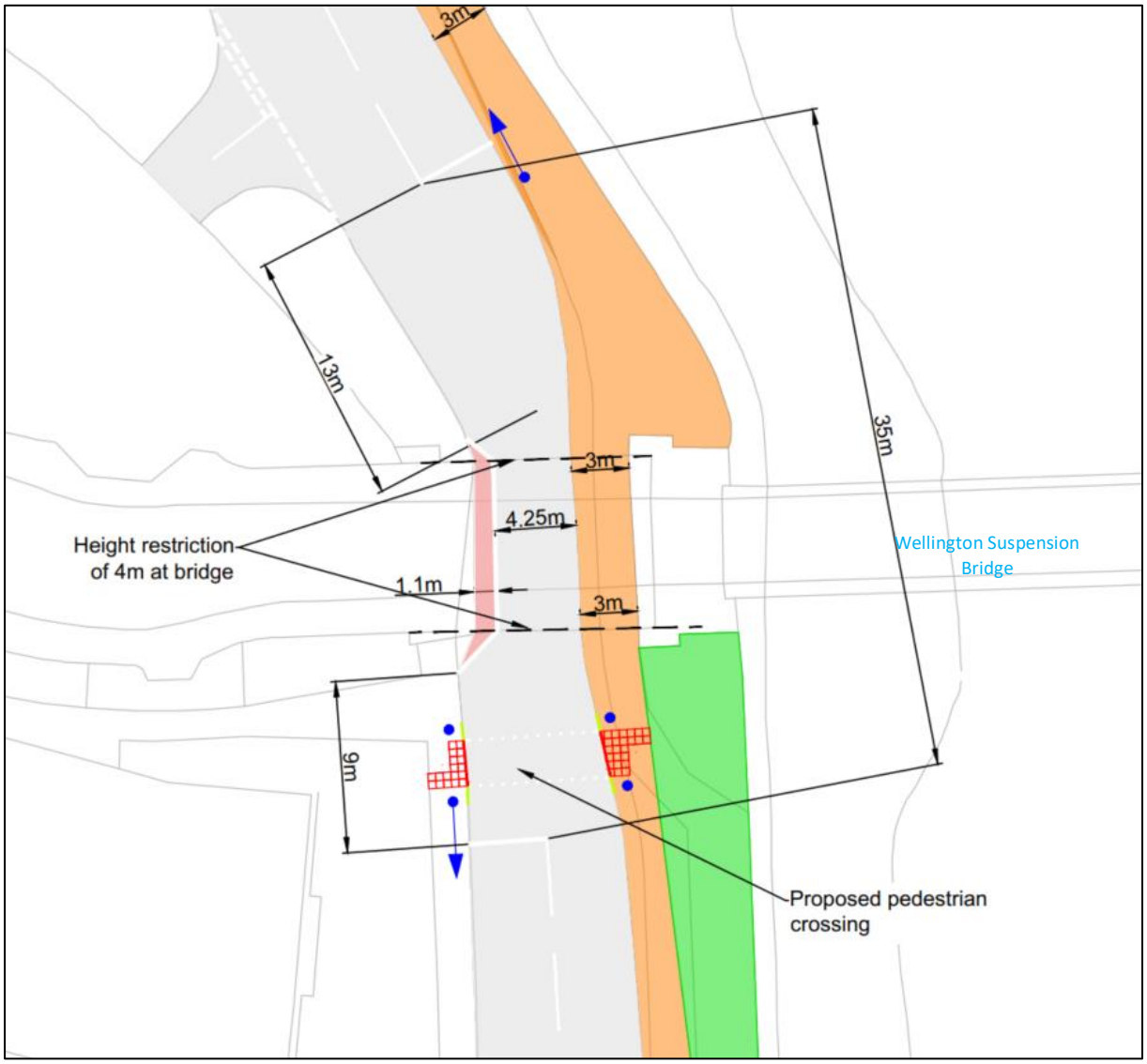


Figure 52. Riverside Drive - Shuttle Working design with Pedestrian Crossing

11.5.6 This concept has not been modelled as part of this study, but could be considered if the Shuttle-working concept design was to be taken further.

11.6 Summary

11.6.1 SYSTRA considered options to further improve walking and cycling provisions on Riverside Drive under the Wellington Road Suspension Bridge.

11.6.2 Two options emerged from the considerations, namely:

- 'Do minimum'
  - Retain current vehicular operation under the Suspension Bridge
  - Widen footway on East side of Riverside Drive between the suspension Bridge and QE Bridge
  - Consider pedestrian and cycle advanced signage on both approaches to the narrowing section.
- Signalised Shuttle Working

- One lane operation under Wellington Suspension Bridge. Two- way traffic operation controlled by traffic signal shuttle working
- Allows for footway widening on east side to facilitate pedestrians and 2-way cycling to design standard
- Model testing showed the signalised junction could operate in conjunction with signalisation of the QE Bridge north junction without detrimental impact to traffic operation at QE Bridge.
- Queue levels are predicted to increase on Riverside Drive routing northbound under Wellington Suspension Bridge
- An additional controlled pedestrian / cycle crossing could be considered as part of the Wellington Bridge Shuttle working signals to allow pedestrians and cyclists to cross from the west to the east footway and through the widened pedestrian and cycle path running parallel to the River Dee.

11.6.3 The next steps are potentially to consider what additional active travel improvement measures on Riverside Drive should be considered best value to be incorporated into the South College Street Phase 2 detailed design.

12. CONSULTATION

12.1 Introduction

12.1.1 On the 16th January 2024, the four shortlisted Options (1 to 4) for the South College Street Junction Improvements - Phase 2 were uploaded to the ACC online 'Consultation Hub' to allow the general public to participate in consultation on the proposed designs for the Queen Elizabeth Bridge / North Esplanade West roundabout. The four options are detailed in Figure 53.

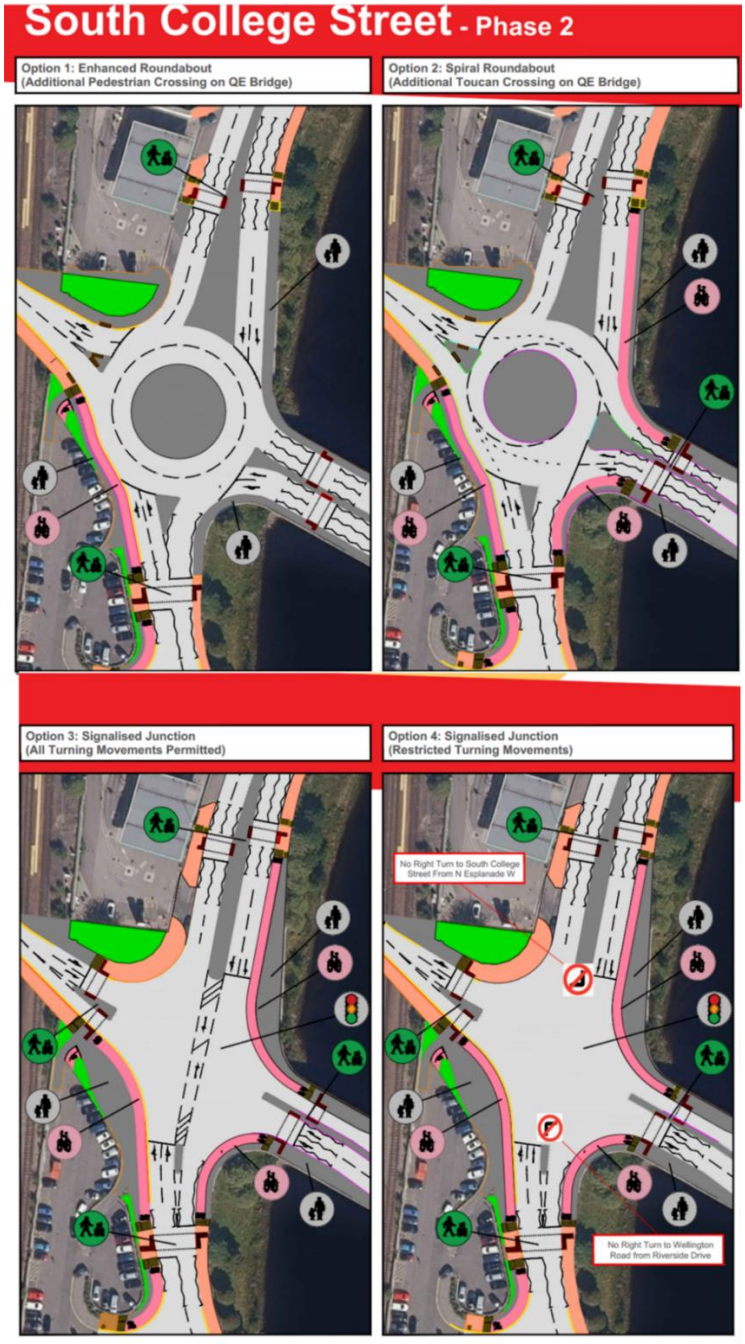


Figure 53. 4 Junction Options for Consultation

12.1.2 In addition, the footway improvements / active travel improvements considered for under the suspension Bridge on Riverside Drive (as detailed in Chapter 11) were also provided for the public's view.

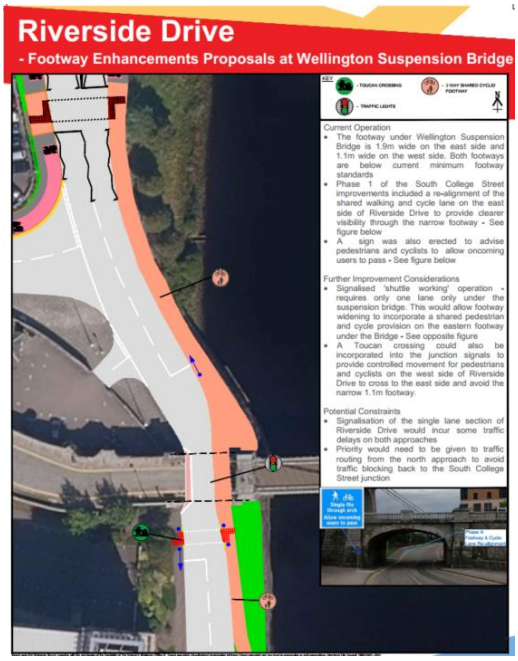


Figure 54. Riverside Drive Improvement Considerations for Consultation

12.1.3 A detailed questionnaire seeking feedback for each of the options was included in the consultation. The full summarised responses are detailed in **Appendix D**. This Chapter provides a summary of the key responses to the proposals.

12.1.4 The on-line consultation ran from 16th January 2024 until the 16th February 2024. There were 222 responses in total.

12.1.5 Further to the public consultation, SYSTRA presented the options to key stakeholders via the monthly ACTUP meeting, held on 8th February 2024. Attendees were invited to provide feedback via the online questionnaire.

12.2 Key Questionnaire Responses

12.2.1 As noted, the responses to the consultation questionnaire are detailed in Appendix D. The key statistics are as follows:

- Approximately 70% of responses were made by those who travel in a vehicle through the area. 14% by walking wheeling, and 9% by cycling
- Less than half of the responses felt that the proposals would improve travel conditions in the area. The breakdown of this question for each option is detailed below:

Summarised Response	Option 1	Option 2	Option 3	Option 4
Improve	34%	34%	35%	13%
Don't Improve	41%	51%	58%	84%
Neutral	25%	15%	8%	3%

- The majority of responses felt that the options would not make them more likely to use sustainable modes of travel. The breakdown of this question for each option is detailed below

Mode Change	More Likely				Less Likely				No Change			
	Opt1	Opt2	Opt3	Opt4	Opt1	Opt2	Opt3	Opt4	Opt1	Opt2	Opt3	Opt4
Walking/Wheeling	14%	14%	21%	13%	13%	13%	16%	24%	55%	55%	45%	44%
Cycling	10%	10%	16%	11%	12%	12%	17%	24%	51%	51%	38%	38%
Bus	1%	1%	4%	2%	11%	11%	16%	22%	56%	56%	48%	47%
Car as Driver	10%	10%	15%	8%	8%	8%	31%	55%	75%	75%	47%	30%
Car as Passenger	5%	5%	10%	6%	8%	8%	23%	39%	67%	67%	44%	35%
Taxi	2%	2%	2%	2%	5%	5%	13%	20%	50%	50%	46%	40%
Van/Commercial Vehicle	3%	3%	1%	3%	5%	5%	13%	14%	45%	45%	39%	37%
Other	2%	2%	1%	0%	4%	4%	10%	14%	42%	42%	36%	36%

- However, 53% of respondents think the proposed options should be taken forward for further development
- In terms of ranking, respondents have ranked the options in order of least impact to general traffic, with Option 1 being most preferrable, then Option 2, then 3, then 4 last. However, if only responders who feel an option should be taken forward, Option 3 would be most preferrable.

Responders	Rank (1st- 4th)			
	Option 1	**Option 2**	**Option 3**	**Option 4**
All responders	1st	2nd	3rd	4th
Only responders that think an option should be taken forward	3rd	2nd	1st	4th

12.3 Consultation Feedback Comments

12.3.1 The following summarises the written feedback to each of the options put forward for consultation:

Option 1

- Mixed views, some consider improvements are minimal and don't go far enough, other say another pedestrian crossing is unnecessary and will result in traffic delays
- There are some views that this is the most sensible or best option out of the four considered as it impacts on general traffic the least
- There are a few comments suggesting to do nothing at this junction (noted for each of the options)
- Those who are seeking improvements for walking cycling note that the measure do not provide any new facilities

Option 2

- A significant number of responses (33) noting that the spiral roundabout design would be very confusing for drivers. This may lead to accidents.

- There are also comments relating to the one lane entry southbound on Queen Elizabeth Bridge and how this would reduce capacity (although traffic only enters this link in one lane currently) – applies to Option 3 and 4 also.
- Further comments that additional crossing provisions will incur further delays for drivers.
- There would still be gaps in the cycle network under this option

Option 3

- A significant number of responders (48) note that signalisation of the junction will cause more congestion and emissions and be less efficient for drivers
- Conversely, there are multiple comments noting that there are clear pedestrian and cycle safety improvements in this option and that this is the safest option.
- Some responders note the importance of responsive traffic signals to best manage the tidal traffic demands at either end of the day
- There are some comments related to the amount of signals / clutter that would be required in a short space

Option 4

- The proposal for banned right turns at the junction, particularly for the right turn from Riverside Drive to Queen Elizabeth Bridge has been met with significant opposition. Responders have noted this will impact on route choice to Torry and will likely result in longer journey times, increased pollution, and traffic increases on less appropriates routes.
- It was also noted that banned turns would be confusing for drivers and that some would likely ignore the restriction

Junction Design Suggestions / Considerations

12.3.2 The following details the alternative or improvement suggestions provided through the consultation where multiple comments have been made. A full summary is presented in Appendix D.

- Do nothing (21 comments)
- Make more use of the suspension bridge for pedestrians and cyclists
- Cut back bushes and improve visibility
- For signalisation options – reduce vehicles speed and reduce footprint of the roundabout to allow more re-allocation of space for active travel or greenspace
- Consider part time signals at the roundabout

Riverside Drive Shuttle Working

- 13 responders noted the considerations were a good idea, 21 noted they were not, with 17 noting that changes to the operation of the narrowed section of Riverside Drive was not required and 32 noted to do nothing
- A significant number of responders thought that the shuttle working signals would cause delays upstream at the Queen Elizabeth Bridge junction
- Pedestrian and cycle users noted that the safety benefits would be welcomed

- In terms of further consideration, there were many suggestions, including
  - Consideration of the footpath to the rear of the offices and flats on the north side of Riverside Drive for pedestrians and cyclists to avoid the underbridge
  - Just remove the narrow footway and increase the footway on the east side
  - Ban larger vehicles – HGV's and buses
  - Widen the gap to allow 2 cars to pass

12.4 Consultation Outcome & Recommendation

Esplanade/Queen Elizabeth Bridge junction

12.4.1 ACC requested the development of a costed option for an effective, feasible, and deliverable intervention that has demonstrable benefits for all modes, particularly public transport and active travel, that the local authorities and partners can develop into a plan for design and implementation.

12.4.2 The general public and stakeholders were consulted on four options presented for the re-design of the Esplanade/Queen Elizabeth Bridge junction. Responders were primarily vehicle drivers or passengers (>70%) which generally reflects the proportion of users of the junction. It is clear that vehicle drivers do not want additional delay or congestion to their journeys and this conflicts with any considered measures to provide improved active travel or controlled traffic flow at the junction. The responses have therefore primarily been negative to any changes at this location.

12.4.3 For those that walk or cycle, there is a perceived safety issue at present with a disconnect for safe movement across certain arms of the junction. The potential signalisation of the junction would enable controlled crossing provisions at all arms of the junction and facilitate connected walking and cycling routes.

12.4.4 In general, Option 1 is deemed to be insufficient for active travel and little different to the current operation. For that reason, drivers tended to favour this option.

12.4.5 For Option 2, the spiral roundabout design is unfamiliar to users and there is a perceived safety issue because of this.

12.4.6 For Option 3, whilst the majority of drivers feel this design would cause further delay to their journey, the design does meet the expectation of improved active travel provision, and signalisation of the junction would enable future bus priority (e.g. for Aberdeen Rapid Transit) Responders noted that traffic signals would require to be responsive to tidal traffic demands.

12.4.7 For Option 4, the proposal to restrict traffic movements at the junction were heavily criticised, citing the impact to those routing to and from the Torry area.

12.4.8 Overall, the general public responders understandably focus on their individual needs and experiences at this location and the majority of drivers do not want to be held up routing into or from the city centre. Conversely, the Council require to consider all traffic and all users and require to align the designs with local and national policies to meet vehicle reduction targets, as well as mode change requirements.

12.4.9 That being the case, and in consideration of all appraisal criteria set out in this report, the recommended scenario for the Esplanade/Queen Elizabeth Bridge junction would be Option 3. Further design detail for this option will require to consider the most efficient and dynamic signal operation to minimise traffic delays.

Riverside Drive Shuttle Working

12.4.10 The general public and stakeholders were consulted on a concept option to improve travel under the Wellington Suspension Bridge on Riverside Drive. Drivers again were not keen on the potential for further delays at this location but the safer walking and cycling provisions would be welcome by some.

12.4.11 The responses included some further design considerations at this location that may be worth further investigation, including the possibility for alternative cycling and walking provisions to the rear of the flats and offices on Riverside Drive.

12.4.12 It is therefore recommended to pause the development of this option until:

1. A decision is made on the Esplanade / Queen Elizabeth Bridge junction

2. Further investigation is undertaken on potential alternative walking and cycling paths to the rear of the properties on Riverside Drive (along the arches) leading to the car park at the Riverside Drive / South College Street junction.

12.5 Options Appraisal Update

12.5.1 Chapter 8 detailed the performance of the four options against:

- Study Objectives
- STAG criteria (Environment; Climate Change; Health, Safety & Wellbeing, Economy, Equality & Accessibility)
- Established Policy Directives

12.5.2 As detailed in Section 8.5, the STAG appraisal criteria includes the appraisal of options against public acceptability.

12.5.3 Whilst the appraisal considered the anticipated public acceptability of the options, based upon the active travel provisions, it did not consider the level of unacceptability of additional delays to drivers.

12.5.4 Whilst the consultation feedback was weighted towards the car driver experience, the feedback for other road users must be equally considered in the appraisal process.

12.5.5 Table 45 therefore presents the revised public acceptability appraisal for each option, with a revised overall appraisal summary presented in Table 46.

Table 45. Public Acceptability

Option	Appraisal	Comments
1	-	Option does not provide any additional benefits to cyclists. Not acceptable to Cycle Groups. Drivers and vehicle passengers feel this option would have the least impact on journey times and congestion
2	✘	The spiral roundabout design is unfamiliar to drivers and is considered dangerous by the public
3	✓	This option was strongly favoured for pedestrian and cycling safety improvements, and would enable bus priority measures in the future. Whilst drivers would be opposed to further delays caused by signals, care design of the traffc signal system could manage the tidal traffic flows more effectively than an uncontrolled roundabout
4	✘	There are issues with this option for commuters relating to the banned right turn from Riverside Drive to QEII Bridge and the impact on route choice to Torry. This will likely result in longer journey times, increased pollution, and traffic increases on less appropriates routes. The benefits gained over Option 3 through the operational efficiency of the signal phasing, are more than offset by the access implications.

Table 46. Updated Option Appraisal Summary

Mode	STAG Criteria	Detail	Ranking			
			Option 1	Option 2	Option 3	Option 4
Appraisal Against Study Objectives						
Active Travel	1.1	Reduce walk distance & travel time	✓	✓✓	✓✓✓	✓✓✓
	1.2	Reduce cycle distance & travel time	-	✓✓	✓✓	✓✓
	2	Increase controlled crossing points	✓	✓✓	✓✓✓	✓✓✓
Public Transport	3.1	Futureproof for future PT routes	✖	✖	✓	✓
	3.2	Bus journey times	-	-	✖	✖
General Traffic	4.1	HGV access through the junction	-	-	✓	✓
	4.2	HGV journey routes	-	-	-	-
	5.1	General Traffic Journey Times	-	-	✖	-
	5.2	General Traffic Queue Lengths	-	-	✖	-
Network Resilience	6	Resilience for PT, General Traffic and Emergency vehicles	-	-	✓✓	✓
Appraisal Against STAG Criteria						
Environment	7	Biodiversity, Construction impact, mode shift, air quality	-	✓	✓	✓
Health, Safety & Wellbeing	8	Pedestrian & cycle provisions	✓	✓✓	✓✓	✓✓
Economy	9	Ease of access to the city centre - freight / retail / mode	-	✓	✓	✓
Equality & Accessibility	10	Safe accessibility for all users	✓	✓✓	✓✓	✓✓
Additional Criteria						
Established Policy Directives	11	Alignment with local and national policy objectives	-	✓✓	✓✓	✓✓
Design Risk	12	Design feasibility & risk- TBD	Low	Med	Med	Med
Public Acceptability	13	Consultation response	-	✖	✓	✖
Affordability	14	Estimated construction costs	<£500k	<£1m	<£2m	<£2m

13. SUMMARY & RECOMMENDATIONS

13.1 Summary

13.1.1 SYSTRA Ltd (SYSTRA) was commissioned by Aberdeen City Council (ACC) to undertake a proportionate STAG (Scottish Transport Appraisal Guidance) appraisal of options for a transport improvement (particularly active travel and public transport improvements) at the Queen Elizabeth Bridge/North Esplanade West roundabout.

13.1.2 ACC requested the development of a costed option for an effective, feasible, and deliverable intervention that has demonstrable benefits for all modes, with a focus on active and sustainable travel, that the local authorities and partners can develop into a plan for design and implementation.

13.1.3 SYSTRA undertook an objective-led study based on Scottish Transport Appraisal Guidance (STAG) principles. It is important to note that this was not a full STAG in itself. The assessment process followed these steps:

- Identify baseline data and existing problems and opportunities
- Collate Do-Minimum information – e.g. junction flow, future infrastructure
- Review Problems, Opportunities, Issues and Constraints
- Set objectives
- High-level sifting
- Option Development, Modelling & Appraisal
- Consultation
- Final Option

13.1.4 A long list of design options were generated through a number of methods. This process generated an initial set of 9 junction design options.

13.1.5 The next stage of sifting was to consider the impact that junction scenarios would have on the operational capacity of the junction. This would identify if the options were feasible for further consideration.

13.1.6 Utilising the Aberdeen City Centre traffic model flows, an operational junction capacity exercise identified that 4 of those options would be able to cater for the predicted traffic demand.

13.1.7 These four options were carried forward for further development, traffic modelling and appraisal. The four options were:

- Option 1: Roundabout – retention of existing roundabout with remote staggered pedestrian crossing on Queen Elizabeth Bridge, approximately 20m from the junction
- Option 2: Staggered Roundabout – Re-alignment of the roundabout eastwards to allow for the implementation of a remote staggered Toucan crossing on Queen Elizabeth Bridge
- Option 3: Signalised Junction – All turning movements permitted. Walk-with staggered Toucan Crossing on Queen Elizabeth Bridge and staggered pedestrian crossing on South College Street. Retention of existing remote crossings on Riverside Drive and North Esplanade West
- Option 4: Signalised Junction – As per Option 3, but with right turns barred on North Esplanade West and Riverside Drive. Simplified signal phasing

13.1.8 The four junctions layouts are shown in Figure 55.

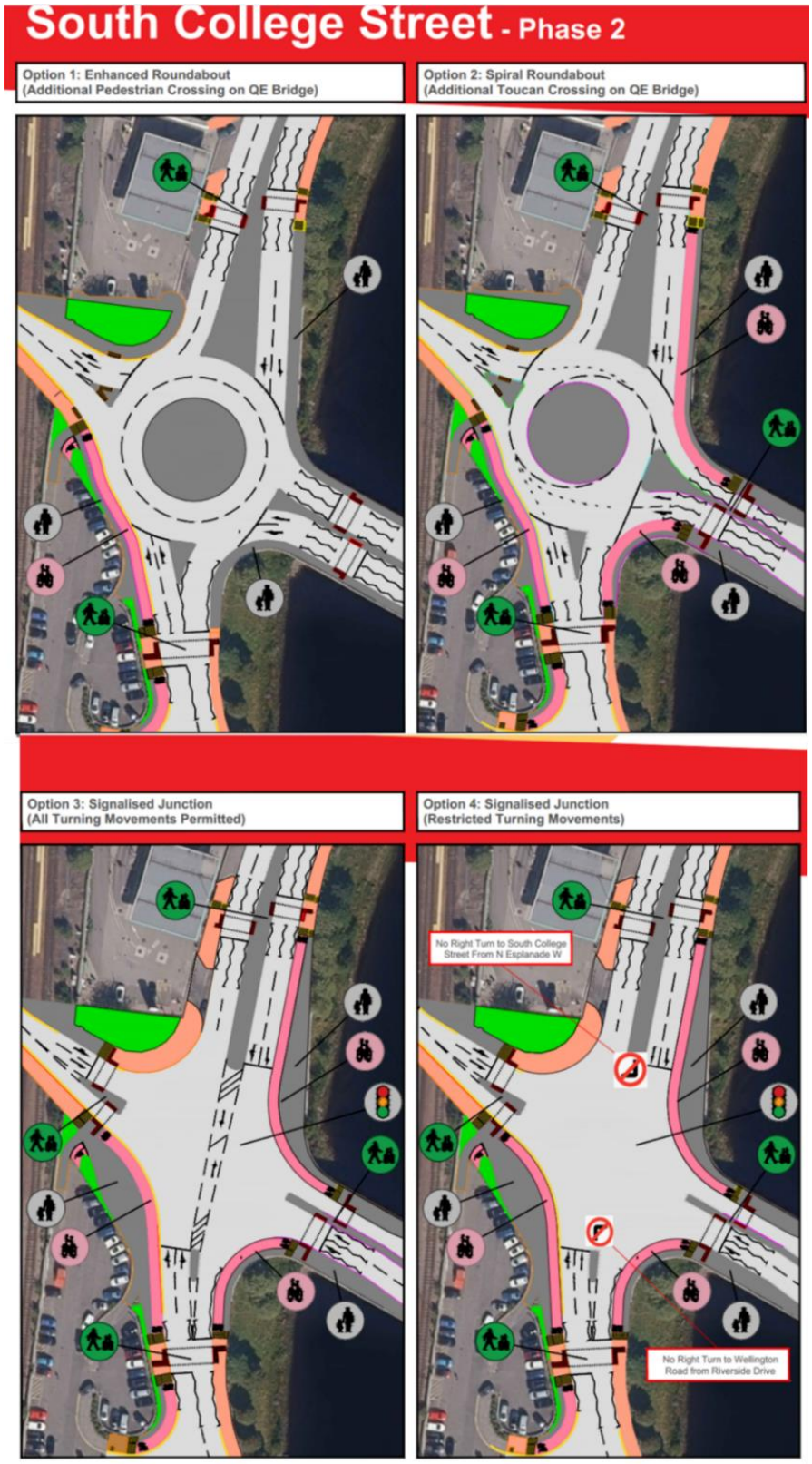


Figure 55. 4 Junction Design Options

13.1.9 The outcome from the options appraisal process is summarised in Table 47.

Table 47. Options Appraisal Summary

Mode	STAG Criteria	Detail	Ranking Option 1	Option 2	Option 3	Option 4
Appraisal Against Study Objectives						
Active Travel	1.1	Reduce walk distance & travel time	✓	✓✓	✓✓✓	✓✓✓
	1.2	Reduce cycle distance & travel time	-	✓✓	✓✓	✓✓
	2	Increase controlled crossing points	✓	✓✓	✓✓✓	✓✓✓
Public Transport	3.1	Futureproof for future PT routes	✖	✖	✓	✓
	3.2	Bus journey times	-	-	✖	✖
General Traffic	4.1	HGV access through the junction	-	-	✓	✓
	4.2	HGV journey routes	-	-	-	-
	5.1	General Traffic Journey Times	-	-	✖	-
	5.2	General Traffic Queue Lengths	-	-	✖	-
Network Resilience	6	Resilience for PT, General Traffic and Emergency vehicles	-	-	✓✓	✓
Appraisal Against STAG Criteria						
Environment	7	Biodiversity, Construction impact, mode shift, air quality	-	✓	✓	✓
Health, Safety & Wellbeing	8	Pedestrian & cycle provisions	✓	✓✓	✓✓	✓✓
Economy	9	Ease of access to the city centre - freight / retail / mode	-	✓	✓	✓
Equality & Accessibility	10	Safe accessibility for all users	✓	✓✓	✓✓	✓✓
Additional Criteria						
Established Policy Directives	11	Alignment with local and national policy objectives	-	✓✓	✓✓	✓✓
Design Risk	12	Design feasibility & risk- TBD	Low	Med	Med	Med
Public Acceptability	13	Consultation response	-	✖	✓	✖
Affordability	14	Estimated construction costs	<£500k	<£1m	<£2m	<£2m

13.1.10 A public consultation exercise provided the following feedback on each option:

- Option 1 is deemed to be insufficient for active travel and little different to the current operation. For that reason, drivers tended to favour this option.
- For Option 2, the spiral roundabout design is unfamiliar to users and there is a perceived safety issue because of this.
- For Option 3, whilst the majority of drivers feel this design would cause further delay to their journey, the design does meet the expectation of improved active travel provision, and signalisation of the junction would enable future bus priority (e.g. for Aberdeen Rapid Transit) Responders noted that traffic signals would require to be responsive to tidal traffic demands.
- For Option 4, the proposal to restrict traffic movements at the junction were heavily criticised, citing the impact to those routing to and from the Torry area.

13.2 Riverside Drive – Active Travel Improvement Options

13.2.1 Adjacent to the QE Bridge Northern junction is a road narrowing section under the Wellington Suspension Bridge on Riverside Drive .

13.2.2 ACC requested that SYSTRA review the measures for walking and cycling through this section of Riverside Drive, including additional measures implemented as part of the South College Street Phase 1 works, and consider if any further measures to improve active travel could be developed. In particular, ACC highlighted the following issues:

- The footways under the Wellington Road Suspension Bridge are below standard (minimum 3m in 'Cycling by Design') for two-way cycling (1.9m on east side, 1.1m

on west side), hence the need to warn users to allow for oncoming pedestrians or cyclists.

- The footway on the east side of Riverside Drive, between the Suspension Bridge and QE Bridge is also below standard width for two way cycling plus pedestrian routing.

13.2.3 SYSTRA considered a series of broad concept options to further improve active travel provisions under the Wellington Suspension Bridge.

13.2.4 A design was developed that Signalised Junction Shuttle Working:

- Signalised junction through the archway of the Wellington Suspension Bridge to limit traffic to one lane. This enables footway widening under the suspension bridge so a shared walking and two way cycle lane can operate to standard (Cycling by design).

13.2.5 Footway widening on Riverside Drive would also be included.

13.2.6 ACC highlighted that there may be further opportunity to utilise the potential shuttle-working signalisation at the Wellington Suspension Bridge to also provide a pedestrian/toucan crossing at this location. The controlled crossing would be incorporated into the signal phasing for the shuttle working signals.

13.2.7 A controlled crossing would enable pedestrians and cyclists on the west side of Riverside Drive to cross to the east side and avoid the narrow 1.1m footway under the suspension Bridge.

13.2.8 This high level design was included in the public consultation exercise. Drivers were not keen on the potential for further delays at this location but the safer walking and cycling provisions would be welcome by some.

13.3 Southern Queen Elizabeth Bridge

13.3.1 The relatively close proximity (140m) of the two junctions at either end of QE Bridge was highlighted as a potential traffic progression issue by ACC. Traffic progression across the Bridge could potentially be hindered if one junction operates under signal control whilst the other remained as a priority roundabout

13.3.2 ACC requested that SYSTRA undertake a sensitivity test for the potential signalisation of the QE Bridge/Wellington Rd/Craig Pl junction (Southern QE Bridge junction) to assess if this provided any benefit to traffic progression across QE Bridge

13.3.3 It is important to note that ACC are fully aware of the need to also review active travel connections around the Southern QE Bridge roundabout and at the southern end of the Wellington Suspension Bridge. However, improvements for active travel around these junctions could potentially be considered remotely from the roundabout itself. It was therefore considered important to ACC to understand if the signalisation of the southern roundabout provided any other transport benefits to the network beyond active travel, especially considering the significant costs associated with full signalisation of this junction.

13.3.4 The modelling suggested that, whilst the signalisation of the southern QE Bridge junction provides more control over egress through the junction, the positive impact to overall progression of traffic across the Bridge is minimal. The northern QE Bridge junction is the

predominant junction that dictates the level of traffic throughput across the bridge (due to the high traffic demand from all four approach arms).

13.3.5 There may therefore be alternative considerations for active travel improvements at this location without the need for full signalisation of the junction.

13.3.6 Some of the feedback from the public consultation related to the requirement to consider safer crossing provisions at this location as part of the overall active travel improvements in the study area. Safe connection to the southern end of the Wellington Suspension Bridge was noted as an intrinsic element of the overall strategy.

13.4 Recommendations

South College Street / Esplanade / Queen Elizabeth Bridge Junction

13.4.1 Overall, the general public responders understandably focus on their individual needs and experiences at this location and the majority of drivers do not want to be held up routing into or from the city centre. Conversely, the Council require to consider all traffic and all users and require to align the designs with local and national policies to meet vehicle reduction targets, as well as mode change requirements.

13.4.2 That being the case, and in consideration of all appraisal criteria set out in this report, the recommended scenario for the Esplanade/Queen Elizabeth Bridge junction would be **Option 3.** Further design detail for this option will require to consider the most efficient and dynamic signal operation to minimise traffic delays.

Riverside Drive Shuttle Working

13.4.3 The consultation responses included some further design considerations at this location that may be worth further investigation, including the possibility for alternative cycling and walking provisions to the rear of the flats and offices on Riverside Drive.

13.4.4 It is therefore recommended to pause the development of this option until:

- A decision is made on the Esplanade / Queen Elizabeth Bridge junction
- Further investigation is undertaken on potential alternative walking and cycling paths to the rear of the properties on Riverside Drive (along the arches) leading to the car park at the Riverside Drive / South College Street junction.

Queen Elizabeth Bridge / Wellington Road Junction

13.4.5 SYSTRA would recommend that remote active travel improvement measures are investigated further to ensure that measures considered at this location provide the most efficient and cost effective solution, and form part of the overall active travel provision in this area of the network.

14. APPENDICES:

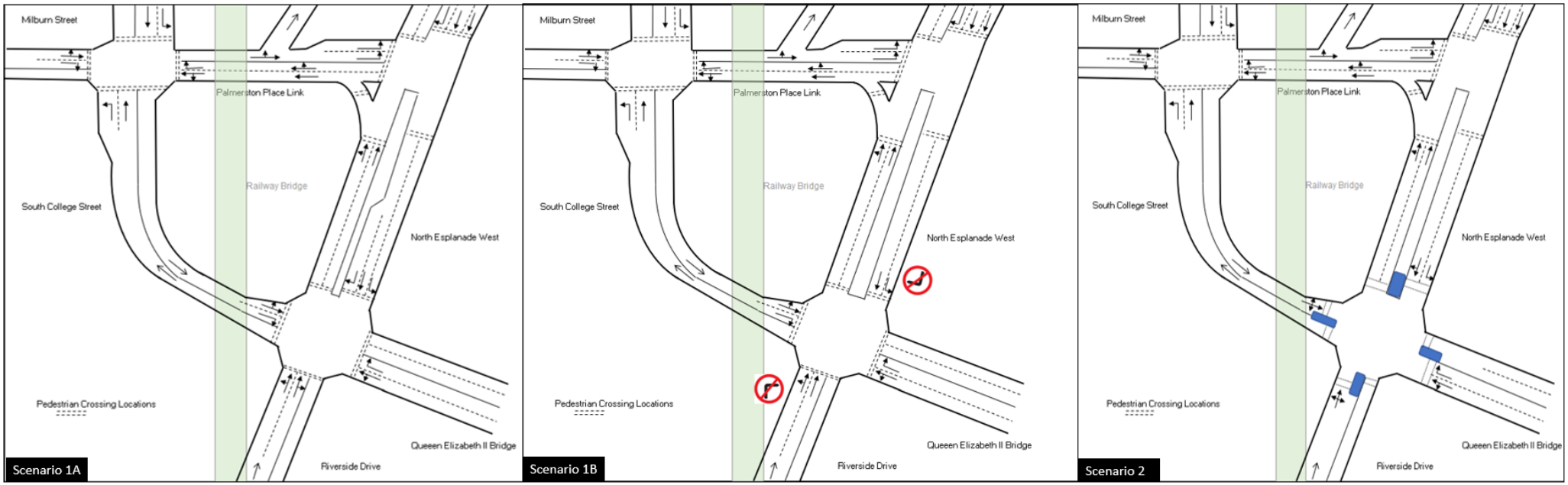
Appendix A: Option Development Schematics

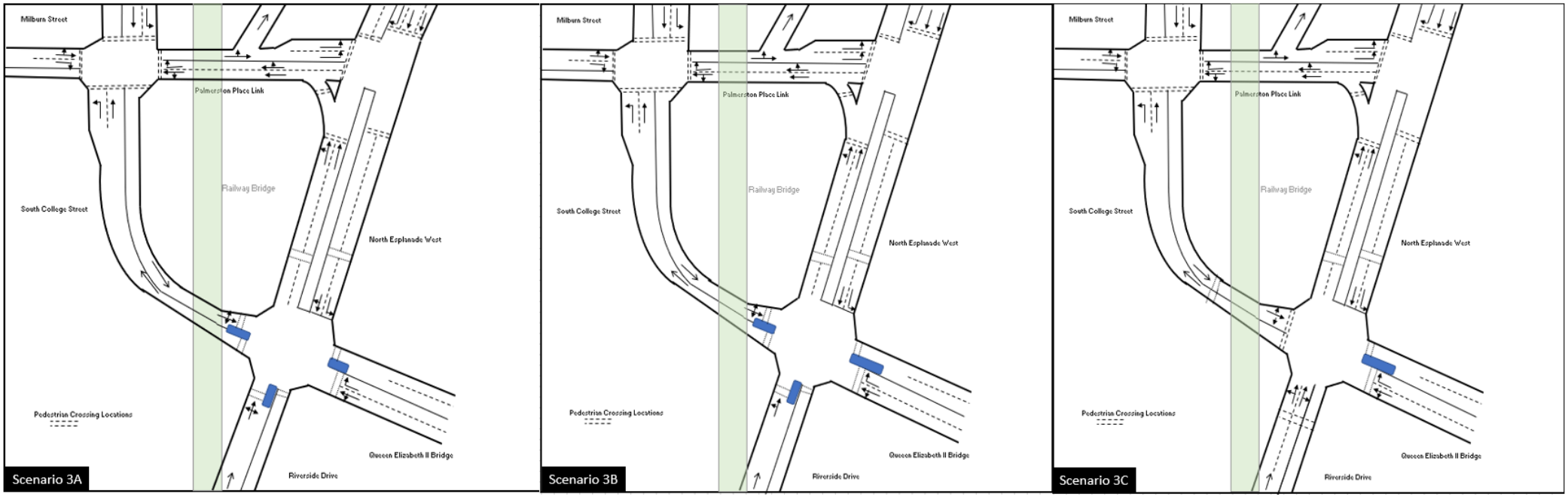
Appendix B: Model Outputs

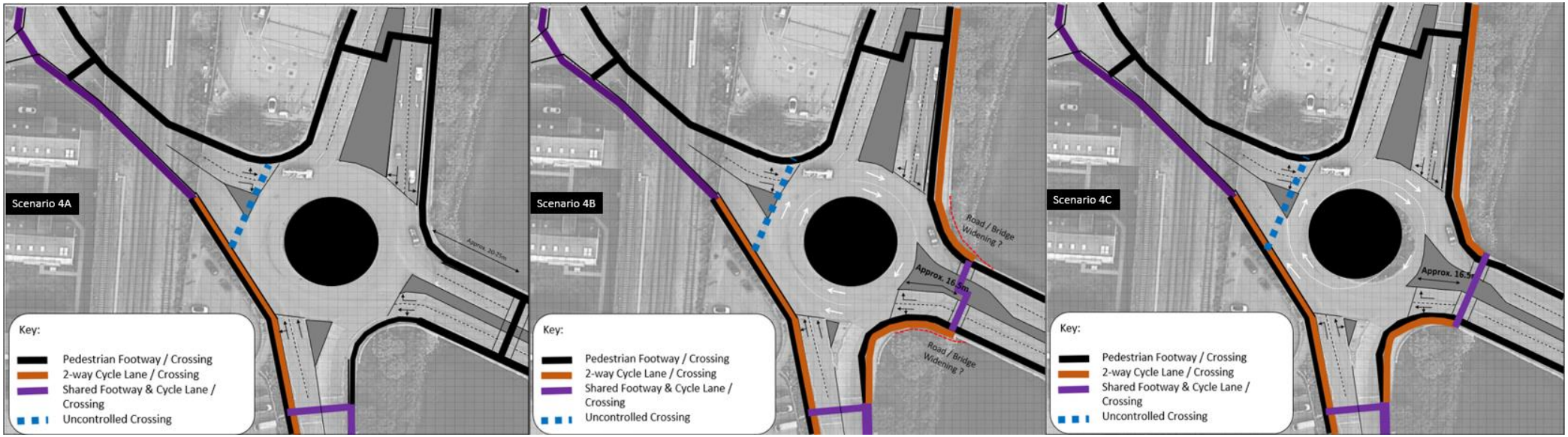
Appendix C: Established Policy Objectives

Appendix D: Public Consultation Feedback

APPENDIX A – OPTION DEVELOPMENT SCHEMATICS

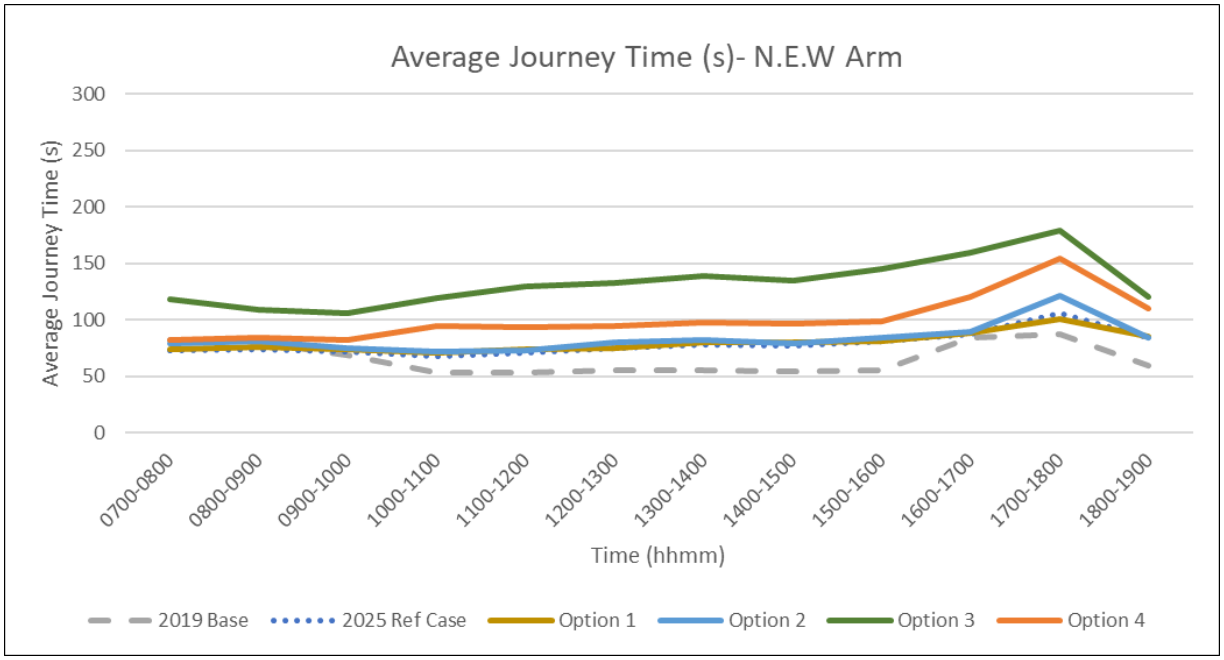


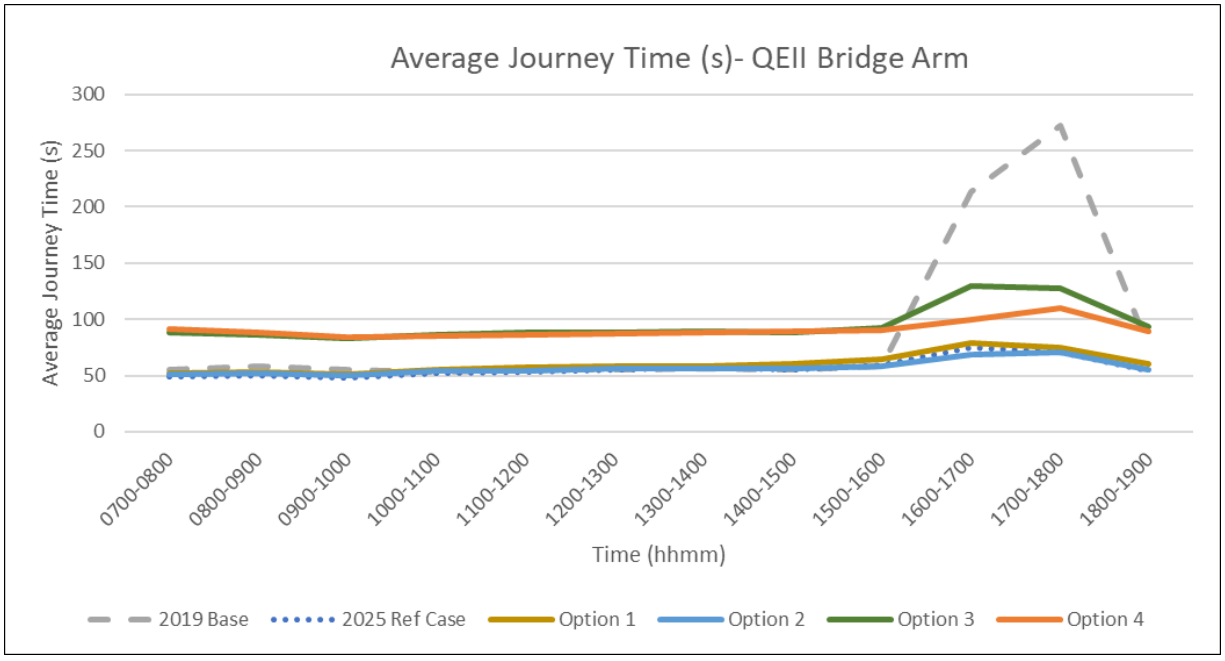

Milburn Street
Palmerston Place Link
Railway Bridge
South College Street
North Esplanade West
Pedestrian Crossing Locations
Queeen Elizabeth II Bridge
Riverside Drive
Scenario 3A
Milburn Street
Palmerston Place Link
Railway Bridge
South College Street
North Esplanade West
Pedestrian Crossing Locations
Queeen Elizabeth II Bridge
Riverside Drive
Scenario 3B
Milburn Street
Palmerston Place Link
Railway Bridge
South College Street
North Esplanade West
Pedestrian Crossing Locations
Queeen Elizabeth II Bridge
Riverside Drive
Scenario 3C

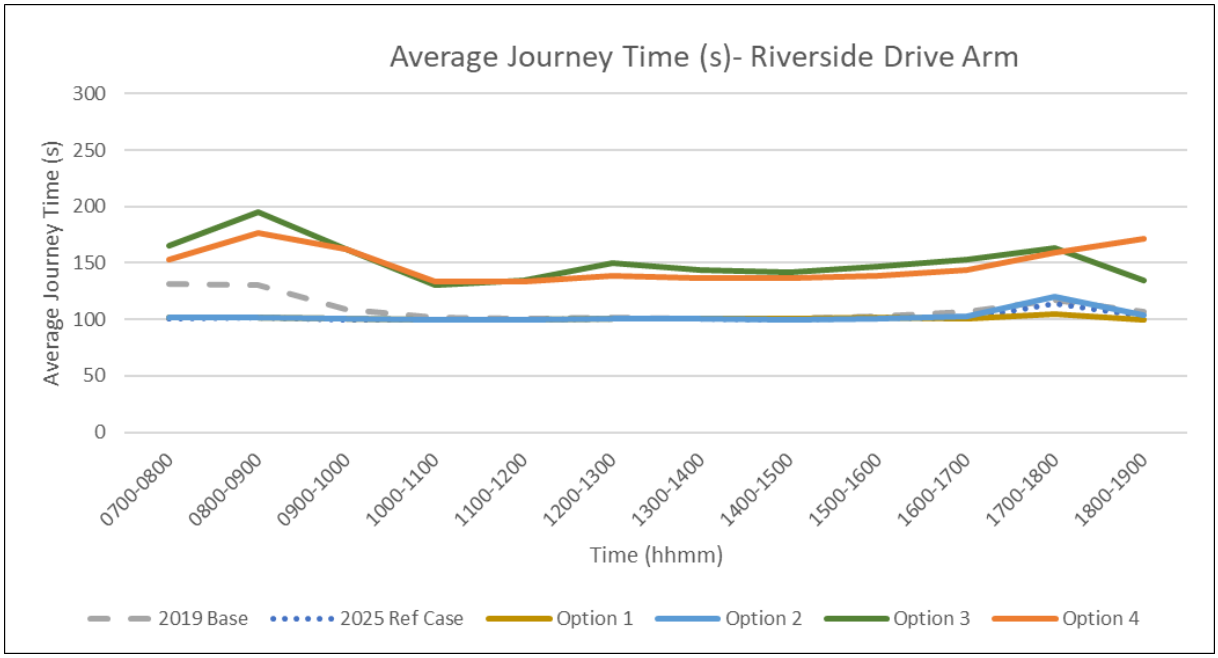

Scenario 4A
Key:
Pedestrian Footway / Crossing
2-way Cycle Lane / Crossing
Shared Footway & Cycle Lane / Crossing
Uncontrolled Crossing
Scenario 4B
Road / Bridge Widening ?
Approx. 16.5m
Road / Bridge Widening ?
Key:
Pedestrian Footway / Crossing
2-way Cycle Lane / Crossing
Shared Footway & Cycle Lane / Crossing
Uncontrolled Crossing
Scenario 4C
Approx. 16.5m
Key:
Pedestrian Footway / Crossing
2-way Cycle Lane / Crossing
Shared Footway & Cycle Lane / Crossing
Uncontrolled Crossing

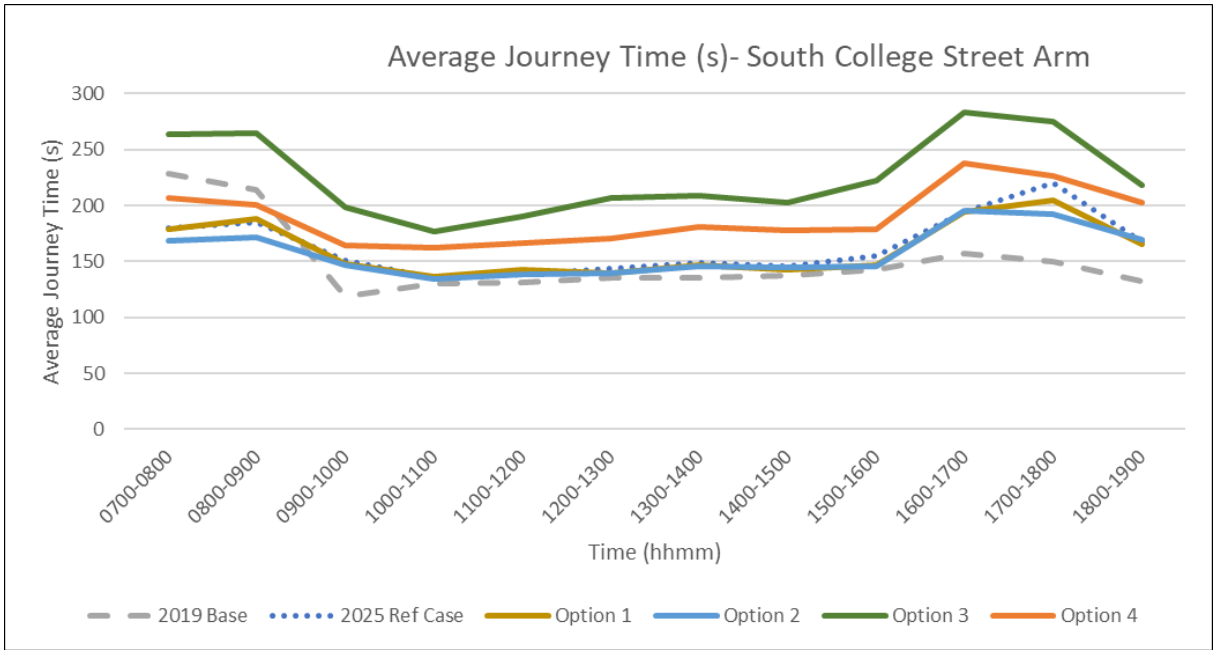
APPENDIX B – MODEL OUTPUTS

Model Average Journey Time Graphs

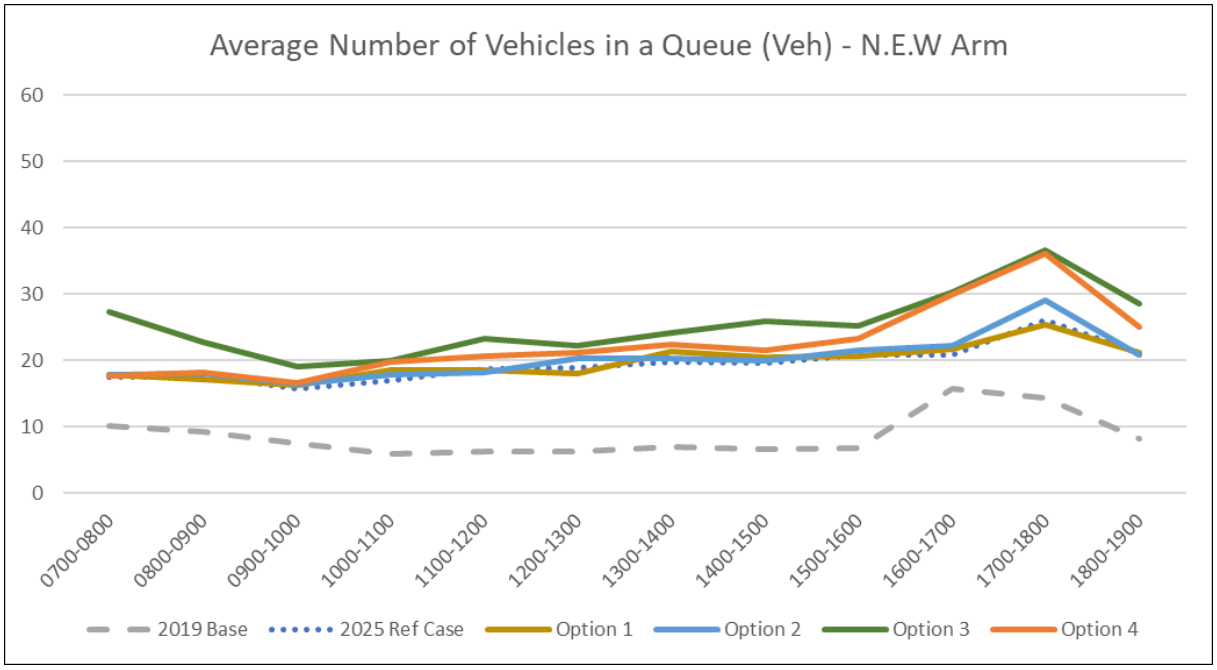


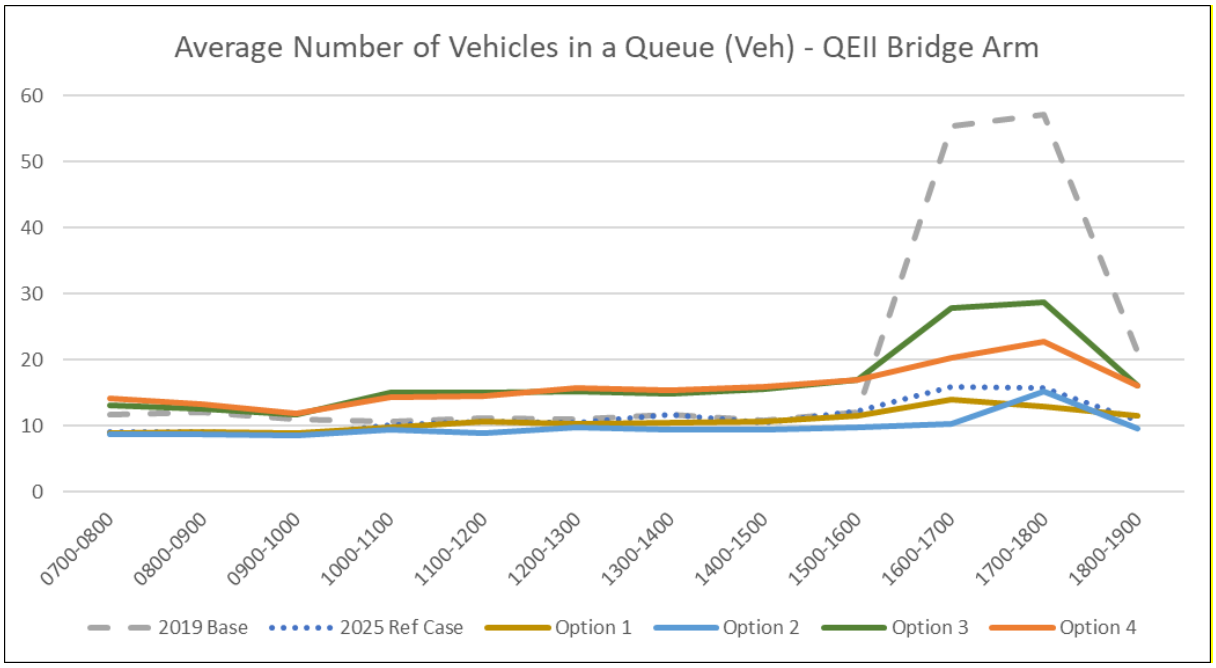


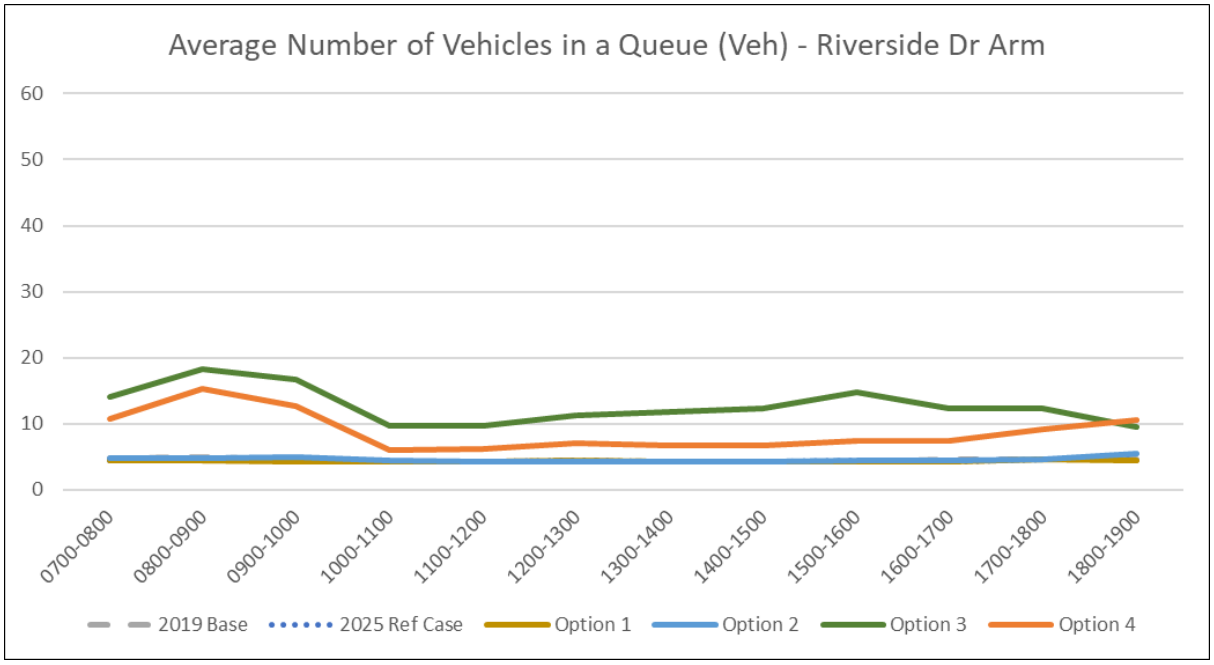

Average Journey Time (s)- Riverside Drive Arm
Average Journey Time (s)
300
250
200
150
100
50
0
0700-0800
0800-0900
0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
1800-1900
Time (hhmm)
2019 Base
2025 Ref Case
Option 1
Option 2
Option 3
Option 4

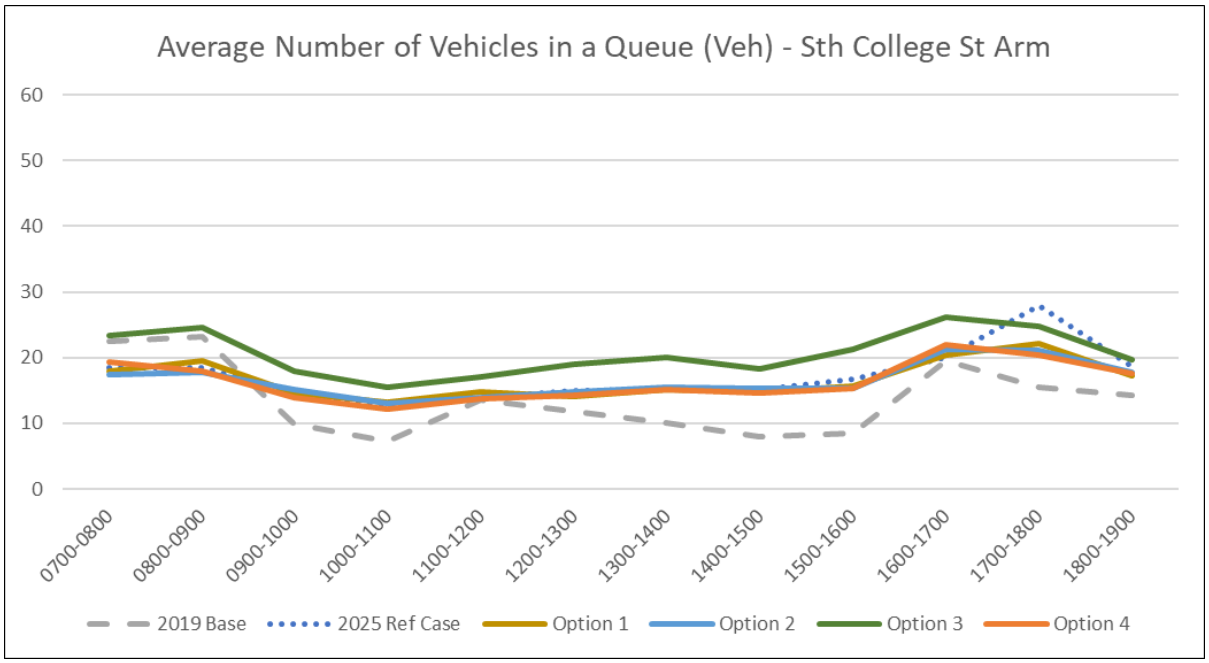

Average Journey Time (s)- South College Street Arm
Average Journey Time (s)
300
250
200
150
100
50
0
0700-0800
0800-0900
0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
1800-1900
Time (hhmm)
2019 Base
2025 Ref Case
Option 1
Option 2
Option 3
Option 4

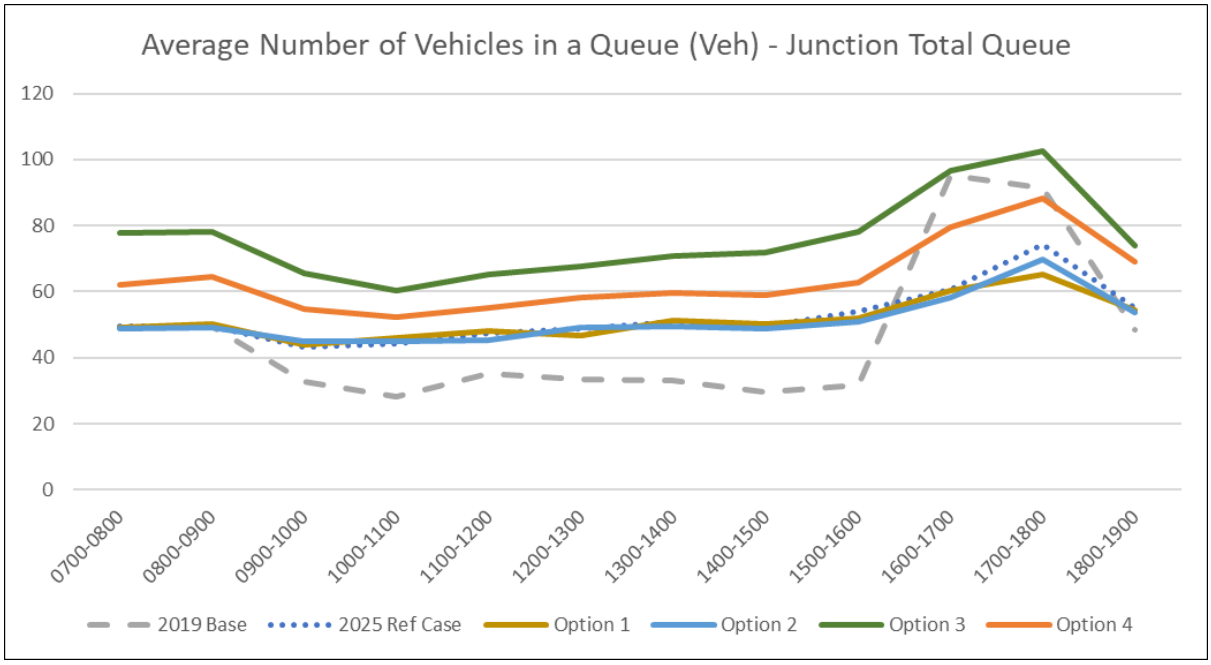
Model Average Queue Length Graphs






Average Number of Vehicles in a Queue (Veh) - Riverside Dr Arm
60
50
40
30
20
10
0
0700-0800
0800-0900
0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
1800-1900
2019 Base
2025 Ref Case
Option 1
Option 2
Option 3
Option 4


Average Number of Vehicles in a Queue (Veh) - Sth College St Arm
60
50
40
30
20
10
0
0700-0800
0800-0900
0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
1800-1900
2019 Base
2025 Ref Case
Option 1
Option 2
Option 3
Option 4


Average Number of Vehicles in a Queue (Veh) - Junction Total Queue
120
100
80
60
40
20
0
0700-0800
0800-0900
0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
1800-1900
2019 Base
2025 Ref Case
Option 1
Option 2
Option 3
Option 4

APPENDIX C – ESTABLISHED POLICY OBJECTIVES

Policy & Objectives	Performance of Option			
	Op1	Op2	Op3	Op4
Local Outcome Improvement Plan				
Stretch Outcomes and associated Key drivers: *SO14: Increase sustainable travel: 38% of people walking and 5% of people cycling as main mode of travel by 2026* *Key driver 14.1 - Supporting different ways for active travel in everyday journeys, using partners and volunteers to address safety, infrastructure, fitness, well-being and confidence.*	✓	✓✓	✓✓	✓✓
Regional Economic Strategy				
To contribute positively to the following objectives and actions of the *Investment in Infrastructure* programme: Objectives: *To regenerate our city centre and towns to become vibrant and attractive places to live, work and invest in* ; *To improve deployment of low carbon transport in the city and urban areas, through active travel networks* ; and *To enable Aberdeen to realise the development opportunities in the City Centre Masterplan and beyond* .	-	✓	✓	✓
National, Regional and Local Transport Strategy				
NTS2 emphasises the Sustainable Travel Hierarchy, which prioritises the needs of those walking, wheeling and cycling above other road users, and introduces the Sustainable Investment Hierarchy which states that local and national investment in transport should follow the principles of the hierarchy.	-	✓	✓	✓
Local Transport Strategy				
Potential to encourage transport modal shift, and hence healthier lifestyles and a reduction in pollution, this option contributes towards the following aims and outcomes identified in the Aberdeen LTS Aims: • *A safe and more secure transport system* ; • *A cleaner, greener transport system* ; and • *An integrated, accessible and socially inclusive transport system* ; • *A transport system that facilitates healthy and sustainable living* . Outcomes: • *Increased modal share for public transport and active travel* ; • *Improved road safety within the city* ; and • *Improved air quality and the environment* .	✓	✓✓	✓✓	✓✓

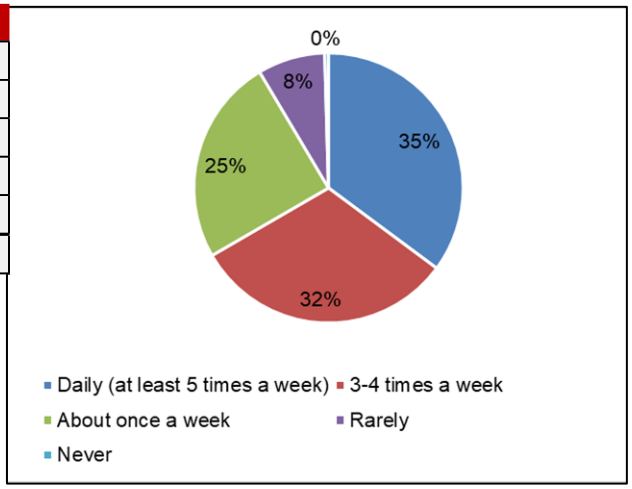
Policy & Objectives	Performance of Option			
	Op1	Op2	Op3	Op4
Sustainable Urban Mobility Plan and Roads Hierarchy				
The option contributes to the following objectives and outcomes of the SUMP: Objectives: *Ensure that the city centre is accessible to, and safe for, all, especially the most vulnerable members of society ;* *Encourage and enable more walking and cycling in the city centre, particularly through the provision of better and safer infrastructure ;* *Develop a network of safe and attractive cycle routes across the city centre, through the provision of low speed, low flow streets and segregated infrastructure, so that an unaccompanied 12-year-old child can safely cycle through the city centre;* *Improve the public transport experience to, from and within the city centre, particularly in terms of achieving shorter and more reliable journey times* Outcomes: • *A city centre that is accessible to all ;* • *A safer city centre ;* • *Improved physical and mental health of the local population;* • *Improved air quality in the city centre ;* • *A reduction in the volume of private vehicles passing through the city centre ;* • *A more pedestrian- and cycle-friendly city centre ;* • *A city centre that prioritises the movement of people over the movement of vehicles ;* • *Increased mode share for active travel to, from and within the city centre ;* • *Increased mode share for public transport to, from and within the city centre* ; and • *Shorter public transport journey times and improved reliability through the city centre .*	✓	✓✓	✓✓	✓✓
Net Zero Vision and Route map for Aberdeen; and Mobility Strategy				
The option supports the Net Zero Route map, specifically the Mobility theme, with its key outcomes of: • *Reduction in traffic across the city ;* • *Reduction in proportion of journeys by car drivers to less than 50% by 2030 ;* • *Increased number of people taking public transport ;* • *Increased number of people walking and wheeling;* and • *Reduced emissions from transport.*	-	✓✓	✓✓	✓✓
Overall Performance	-	✓✓	✓✓	✓✓

APPENDIX D– PUBLIC CONSULTATION FEEDBACK

Part 1 – Multiple Choice

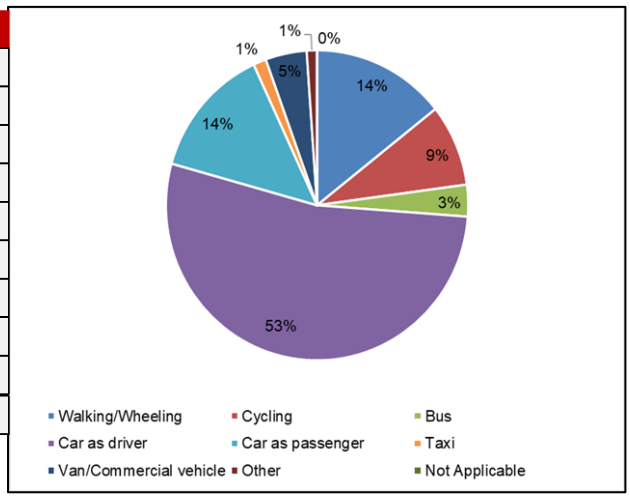
Q1. How Often do you currently travel through the North Esplanade West / Queen Elizabeth Bridge Junction during a typical week?

Frequency	Responses	%
Daily (at least 5 times a week)	78	35.1%
3-4 times a week	70	31.5%
About once a week	55	24.8%
Rarely	18	8.1%
Never	1	0.5%
	222	



Q2. How do you typically make these journeys?

Mode	Responses	%
Walking/Wheeling	52	14%
Cycling	31	9%
Bus	12	3%
Car as driver	193	53%
Car as passenger	50	14%
Taxi	5	1%
Van/Commercial vehicle	16	4%
Other	4	1%
Not Applicable	0	0%
	363	

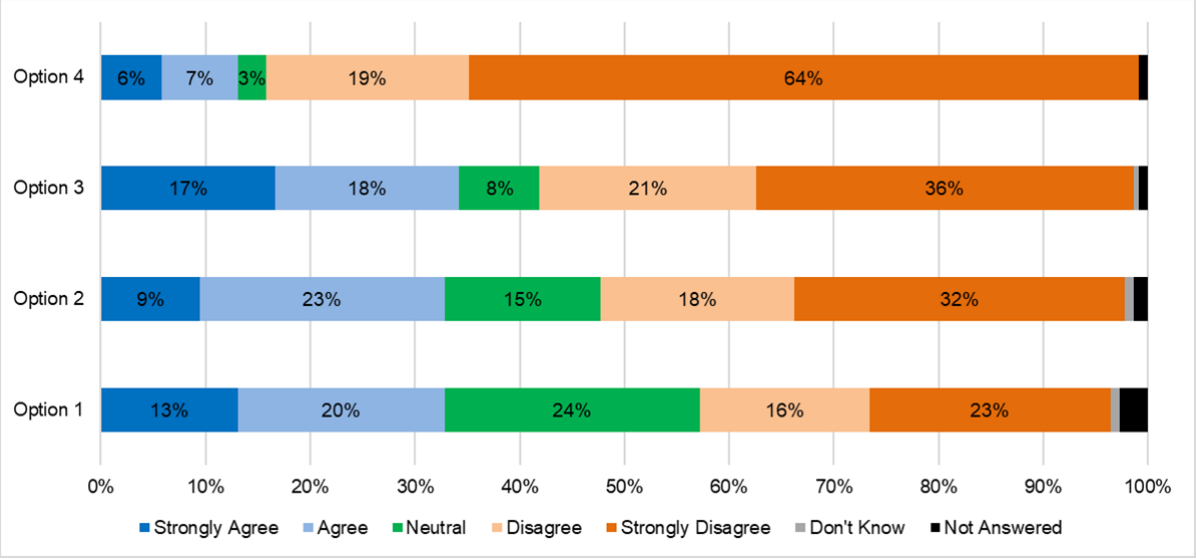


Q3. To what extend to you agree that Options 1 to 4 would improve travel conditions at the North Esplanade West / Queen Elizabeth Bridge junction?

Response	Option 1	Option 2	Option 3	Option 4
Strongly Agree	29	21	37	13
Agree	44	52	39	16
Neutral	54	33	17	6
Disagree	36	41	46	43
Strongly Disagree	51	70	80	142
Don't Know	2	2	1	0
Not Answered	6	3	2	2
TOTAL	222	222	222	222

Response	Option 1	Option 2	Option 3	Option 4
Strongly Agree	13%	9%	17%	6%
Agree	20%	23%	18%	7%
Neutral	24%	15%	8%	3%
Disagree	16%	18%	21%	19%
Strongly Disagree	23%	32%	36%	64%
Don't Know	1%	1%	0%	0%
Not Answered	3%	1%	1%	1%

Summarised Response	Option 1	Option 2	Option 3	Option 4
Agree	34%	34%	35%	13%
Disagree	41%	51%	58%	84%
Neutral	25%	15%	8%	3%



Q4. If **Option 1** was implemented, would it make you more or less likely to use the following modes of transport?.

Mode Change - Option 1	More Likely	Less Likely	No Change	Not Applicable	Don't Know	Total
Walking/Wheeling	14%	13%	55%	17%	0%	213
Cycling	10%	12%	51%	27%	0%	210
Bus	1%	11%	56%	30%	2%	206
Car as Driver	10%	8%	75%	5%	2%	214
Car as Passenger	5%	8%	67%	18%	2%	207
Taxi	2%	5%	50%	38%	4%	204
Van/Commercial Vehicle	3%	5%	45%	45%	2%	202
Other	2%	4%	42%	49%	4%	191

Q5. If **Option 2** was implemented, would it make you more or less likely to use the following modes of transport?.

Mode Change - Option 2	More Likely	Less Likely	No Change	Not Applicable	Don't Know	Total
Walking/Wheeling	14%	13%	55%	17%	0%	211
Cycling	10%	12%	51%	27%	0%	210
Bus	1%	11%	56%	30%	2%	197
Car as Driver	10%	8%	75%	5%	2%	211
Car as Passenger	5%	8%	67%	18%	2%	203
Taxi	2%	5%	50%	38%	4%	199
Van/Commercial Vehicle	3%	5%	45%	45%	2%	198
Other	2%	4%	42%	49%	4%	190

Q6. If **Option 3** was implemented, would it make you more or less likely to use the following modes of transport?.

Mode Change - Option 3	More Likely	Less Likely	No Change	Not Applicable	Don't Know	Total
Walking/Wheeling	21%	16%	45%	17%	2%	210
Cycling	16%	17%	38%	26%	2%	208
Bus	4%	16%	48%	29%	3%	199
Car as Driver	15%	31%	47%	5%	2%	212
Car as Passenger	10%	23%	44%	17%	5%	201
Taxi	2%	13%	46%	36%	4%	196
Van/Commercial Vehicle	1%	13%	39%	44%	3%	195
Other	1%	10%	36%	52%	1%	189

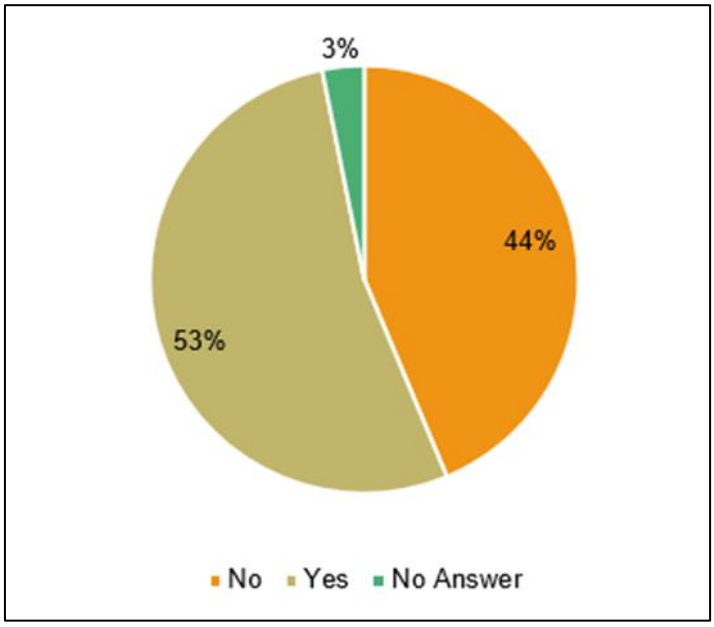
Q7. If **Option 4** was implemented, would it make you more or less likely to use the following modes of transport?.

Mode Change - Option 4	More Likely	Less Likely	No Change	Not Applicable	Don't Know	Total
Walking/Wheeling	13%	24%	44%	18%	1%	206
Cycling	11%	24%	38%	25%	2%	206
Bus	2%	22%	47%	29%	1%	197
Car as Driver	8%	55%	30%	5%	3%	211
Car as Passenger	6%	39%	35%	18%	3%	200
Taxi	2%	20%	40%	34%	3%	196
Van/Commercial Vehicle	3%	14%	37%	45%	2%	196
Other	0%	14%	36%	49%	1%	185

Summary of Question 4-7: Would the options make you more or less likely to use the following modes of transport?

Mode Change	More Likely				Less Likely				No Change			
	Opt1	Opt2	Opt3	Opt4	Opt1	Opt2	Opt3	Opt4	Opt1	Opt2	Opt3	Opt4
Walking/Wheeling	14%	14%	21%	13%	13%	13%	16%	24%	55%	55%	45%	44%
Cycling	10%	10%	16%	11%	12%	12%	17%	24%	51%	51%	38%	38%
Bus	1%	1%	4%	2%	11%	11%	16%	22%	56%	56%	48%	47%
Car as Driver	10%	10%	15%	8%	8%	8%	31%	55%	75%	75%	47%	30%
Car as Passenger	5%	5%	10%	6%	8%	8%	23%	39%	67%	67%	44%	35%
Taxi	2%	2%	2%	2%	5%	5%	13%	20%	50%	50%	46%	40%
Van/Commercial Vehicle	3%	3%	1%	3%	5%	5%	13%	14%	45%	45%	39%	37%
Other	2%	2%	1%	0%	4%	4%	10%	14%	42%	42%	36%	36%

Q8. Do you think any of the proposed options should be taken forward for further development?



Q9. How would you rank the options for improvements to the North Esplanade West / Queen Elizabeth Bridge junction (1 being most preferred, 4th being least preferred)

Rank	Option 1	Option 2	Option 3	Option 4
1st	103	31	53	16
2nd	38	108	37	20
3rd	30	52	105	16
4th	32	12	8	152
Overall Ranking	**1st**	**2nd**	**3rd**	**4th**

Part 2 – Summary of Comments for Each Option

Option 1

User / Comment	Positive Comments	No.	Negative Comments	No.
Pedestrians	When walking, its currently difficult to find the right place to cross QE Bridge	1	Improvements are minimal	3
	Great idea, people try to cross the QE Bridge daily	1	Proposed crossing is too far back from the desire line	2
			Unlikely to be used as there is an increased walk time	1
			Pointless, as people should use the footbridge	1
			Doesn't include a crossing at South College St, which is needed	1
Cyclists			Doesn't offer anything new for cycle network. Still large gaps in cycle network	9
			Still dangerous for cyclists	1
			Doesn't offer any safe routes too and from Torry area	1
Buses			Buses current don't use this junction	1
Vehicle Drivers	Best Option of the 4 presented for vehicle capacity Least disruptive to traffic of the four options Traffic must keep moving	8 7 2	An additional pedestrian crossing reduces traffic flows and increases congestion This will cause tailbacks at the bridge Cycle lanes don't help the flow of traffic The pedestrian crossing will make it more difficult for lorries to maneuver	7 2 1 1
Safety	Most sensible / best Option Best Option of the 4 presented for vehicle capacity	9 8	Pedestrian crossings just after a roundabout is not safe Roundabout is less safe than signalise junction	4 2
Rating	Cheapest Option	1		
General Comments			Very few cyclists so no requirement to provide cycle lanes	7
			Not much different to the current operation	6
			Need to understand No. of users for each mode before providing facilities	2
			Very few pedestrians in this area so no requirement Waste of money	2 1
Design Suggestions / Considerations	Do nothing (leave it as it is)			10
	Need to direct pedestrians & make more use of the suspension Bridge			3
	Cut back bushes and trees to improve visibility			1
	Consider reducing North Esplanade to 1 lane to facilitate segregated cycle lanes			1
	Move the remote pedestrian crossing closer to the junction			1
	Consider a pedestrian crossing at the southern end of Queen Elizabeth Bridge			1
	Consider Zebra crossings instead of signal crossings			1
	Need to make public transport as accessible as possible			1
	Consider part-time signals at the roundabout			1

Option 2

User / Comment	Positive Comments	No.	Negative Comments	No.
Pedestrians	A crossing over QE Bridge would enable safer crossing	1	The pedestrian crossing is unnecessary	2
			This provides little improvement for pedestrians	1
Cyclists	This has better provisions than Option 1 (a connected Riverside cycle route)	1	Still large gaps in cycle network (e.g. North Esplanade West to South College Street)	5
			Any cycle provisions require a wider connected network	2
			Spiral roundabout would be dangerous for on-street cycle users	1
			Toucans don't work in Aberdeen	1
			The design requires a cycle lane on QE Bridge	1
			Cyclists don't use cycle lanes, they use the road	1
Buses			Buses current don't use this junction	1
Vehicle Drivers	This option is better than signalisation, as traffic needs to keep moving	3	Very confusing for drivers with potential road safety issues	33
			The reduced lane capacity to 1 lane southbound will reduce capacity for traffic	8
			More pedestrian crossing provisions will delay drivers	6
			The spiral junction is in too small a space with poor visibility	1
Safety			Pedestrian crossings just after a roundabout is not safe	3
Rating	Better than Option 1	3		
	Best Option (good balance between traffic and cycle provisions)	3		
General Comments	There is no need to replace the roundabout with signals	3	This option is not much different to the current operation	1
	Traffic is held up anyway so additional crossings wont make much difference	1	There are enough cycle / pedestrian paths and crossings already	1
Design Suggestions / Considerations	Make more use of the footbridge			4
	Do nothing (leave it as it is)			2
	Cut back bushes and trees to improve visibility			1
	Build a pedestrian underpass			1
	Use the new space created on the carriageway to create a filter lane			1
	Consider Zebra crossings instead of signal crossings			1

Option 3

User / Comment	Positive Comments	No.	Negative Comments	No.
Pedestrians	There are clear pedestrian safety improvements in Option 3	8	Shared walkways for pedestrians and cyclists is not a good idea	2
			The remote crossings are not on the desire line for crossing	1
Cyclists	There are clear cycle safety improvements in this option	10	Shared walkways for pedestrians and cyclists is not a good idea	2
	The crossing distances for cyclists is much shorter	1	This option is less safe for on-road cyclists	1
			There are no cycle provisions on QE Bridge	1
Buses				
Vehicle Drivers	The slight additional delay to drivers would be acceptable if signal timings were tidal to cater for varying demands	6	Signalised junction will cause more congestion (& emissions), less efficient	**48**
	Signalisation is better than a free-for-all at the roundabout	5	Allowing only 1 lane southbound onto QE Bridge would result in delays	5
	Signalisation is safer	1	There would be too many signals in a short space	3
	Controlled traffic movement is better	1	The right turn filter lanes would block back and cause congestion	2
			Signalisation would create more chance of collisions	1
Safety			Signalisation would create more chance of collisions	1
Rating	This is the most sensible / best / safest option	14		
General Comments	More cycle provisions will help move towards net zero	1	This would be expensive, for no real benefits	3
	The current roundabout is dangerous	1	Need to understand No. of users for each mode before providing facilities	1
			Roads are for cars	1
			The delays would encourage use of residential streets	1
			More traffic signals are a visual blight on the landscape	1
			Unfriendly to vulnerable road users	1
			Signalisation removes the ability of u-turning	1
Design Suggestions / Considerations	Do nothing (leave it as it is)			4
	Reduce speed and tighten radii to allow more reallocation of space for active travel or greenspace			4
	Consider Part-time signals at the roundabout			2
	Need to direct pedestrians & make more use of the suspension Bridge			2
	Build a cycle /pedestrian underpass			1
	Include advance cycle boxes			1
	Bring all crossings into the junction on a 4 stage signal setting			1
	Consider a pedestrian crossing at the southern end of Queen Elizabeth Bridge			1
	Consider Cyclops Junction (as per cycling by design)			1
	Need to link cycle lanes on South College Street directly onto QE Bridge			1
	The pedestrian crossing on South College Street should not be staggered			1
	No requirement for the right turn from the Esplanade onto South College Street			1

Option 4

User / Comment	Positive Comments	No.	Negative Comments	No.
Pedestrians				
Cyclists			The cycle paths require to be considered in the context of a wider cycle network	1
Buses				
Vehicle Drivers	The signalised junction design should prevent traffic jams and free up the junction	1	The banned right turn into QE Bridge will impact on route choice to Torry and have a negative impact elsewhere in the network (already busy or residential)	30
	The simplified junction movements eliminate the conflicting movements	1	The banned right turn to QE Bridge will cause longer journeys and increase pollution	22
	It would be Ok to ban the right turn to South College Street as the new Palmerston Road junction caters for this	1	The banned right turn to QE Bridge is very restrictive and makes Torry less accessible	19
			The banned right turns would be confusing for drivers (there is also a banned right turn at Victoria Bridge)	7
			This option would make access to the boat club very difficult	5
			This option is less car friendly	3
			This would make deliveries more difficult	2
			Abbotswell Road already has long queues, this design will add to the congestion	1
Safety				
Rating				
General Comments			Many people will ignore the right turn ban	2
			Signalising the junction will result in a loss of greenery	1
			Council money should be spent on schemes that will improve the network	1
			Signalisation will create too many traffic lights at this location	1
			Signalisation removes the ability of u-turning	1
			Need to understand No. of users for each mode before providing facilities	1
Design Suggestions / Considerations	Do nothing (leave it as it is)			5
	Need to direct pedestrians & make more use of the suspension Bridge			4
	Build a cycle /pedestrian underpass across QE Bridge			2
	Consider Cyclops / Dutch Style junction			2
	Consider Part-time signals at the roundabout during the peak			1
	Consider a pedestrian and cycle crossing at the southern end of Queen Elizabeth Bridge			1

Riverside Drive Shuttle-Working Comments

Positive Comments for Riverside	No.	Negative Comments for Riverside	No.
Good idea	13	Not a good idea	21
		Not needed	17
Footways are too narrow / dangerous, any option to make it more cycle / pedestrian friendly should be promoted	3	Shuttle working will restrict movement and cause delays upstream at the QE Bridge roundabout	18
Lots of accidents here so traffic calming measures are welcome	1	Will create queues and affect traffic flows & Air quality	12
Should already be in place to improve safety for all users	1		
Important to maintain this route as a pedestrian access	1		
Essential that shuttle working lights are tidal / optimised for efficiency	2		

Other Comments	
Queues would block access to the Riverside Drive residential access Road	3
Needs to be more ambitious than just adding traffic lights and creating further bottleneck	1
Need to reduce traffic on Crown Street	1
There needs to be improved cycleway from Duthie Park to QE Bridge/Suspension Bridge	1
Need evidence of accidents here and No. of cyclists	1
Lights need to tie in with the Signalised junction at QE Bridge	1
Too many provisions for cyclists	1
Toucan Crossing would not get used by cyclists	1
Might create vehicle rat running through the access road to the rear of the housing	1
Go with the safest option	1
Consider 3 way signal to include access to the flats	1

Options / Considerations	
Do nothing (not an issue at present)	32
Consider using the path at the rear of the offices and flats on the north side of Riverside	5
Remove narrow footway and increase footway on east side to allow cycles	4
Just ban wide or heavy vehicles or city link buses	3
Widen the gap to allow two cars to clearly pass	3
Needs to be considered as part of a wider cycle / pedestrian network	2
Floating walkway that curves away from the path, under the suspension Bridge and re-joins	2
Include better lighting and road warning signs of narrow road	2
Make better use of the suspension Bridge and the link from Riverside Drive to Wellington Brae	2
Consider traffic priority junction (for westwards) . It doesn't need to be signalised	2
Consider a crossing further south on Riverside Drive at Polmuir Road	2
Entrance to Riverside Drive Car Park needs to be narrowed	1
New footway along the arches with raised kerbs to prevent cars from blocking the footway	1
Make it one-way for traffic and two way for cyclists and pedestrians	1
Extend the route all the way to the King George VI Bridge and join the Shell path and along	1
Install an underpass at the QE Bridge	1
Close the road to all traffic	1
Can a path be routed elsewhere to avoid the need to reduce the road to one lane	1
Focus on better access to the suspension bridge	1
Make a walkway cantilevered out above the river / under the bridge outboard of the	1
New footway/cycleway constructed over the river, under the existing span (this will allow	1
Lower the speed limit and introduce speed bumps to slow cars	1
Improve active travel though Duthie Park and residential streets to the north of Riverside	1
Remove the Bridge	1

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