



Jacobs *steer*

# Edinburgh Strategic Sustainable Transport Study Phase 2

Summary Report

12 February 2021

The City of Edinburgh Council



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## Summary Report

Project No.:	BESP0027
Revision:	1
Document Status:	Final
Date:	12.02.21
Client Name:	The City of Edinburgh Council

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## Contents

<b>1.</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Background and Context .....	1
1.2	Purpose of this Study .....	2
<b>2.</b>	<b>Policy Context.....</b>	<b>3</b>
2.1	Introduction .....	3
2.2	The National Policy Context .....	3
2.3	The Regional Policy Context .....	4
2.4	Current Issues and Challenges .....	6
2.5	Developing Study Objectives .....	7
<b>3.</b>	<b>Option Assessment Framework &amp; Process .....</b>	<b>9</b>
3.1	The Option Assessment Process .....	9
3.2	Consideration of Transit Modes .....	9
3.3	Options Assessment Framework .....	10
3.4	Overview of Assessment Framework .....	12
3.5	Objective-Led Criteria.....	13
3.6	Deliverability Criteria.....	14
<b>4.</b>	<b>Transit as part of an Integrated Corridor Solution .....</b>	<b>16</b>
4.1	Introduction .....	16
4.2	Guiding Principles for Option Development .....	16
<b>5.</b>	<b>Granton Corridor – Options and Option Assessment.....</b>	<b>20</b>
5.1	Corridor Overview.....	20
5.2	Granton North (Section A) Options .....	21
5.3	Granton South (Section B) Options .....	25
<b>6.</b>	<b>South East Edinburgh Corridor – Options and Option Assessment .....</b>	<b>31</b>
6.1	Corridor Overview.....	31
6.2	South East Corridor (Section D) Options.....	32
6.3	South East Corridor (Section E) Options .....	35
<b>7.</b>	<b>City Centre Infrastructure Options.....</b>	<b>41</b>
7.1	City Centre Overview .....	41
7.2	City Centre (Section C) Options.....	41
<b>8.</b>	<b>Recommendations and Next Steps .....</b>	<b>46</b>
8.1	Summary of Recommendations – Tram Options.....	46
8.2	Consideration of Alternative Transit Modes (BRT) .....	46
8.3	Next Steps – Development of the Strategic Business Case .....	48

# 1. Introduction

## 1.1 Background and Context

Edinburgh is a successful and thriving city, home to just over 500,000 people. Over the period 2016 to 2026, it is projected that the population will grow by 7.7%<sup>1</sup>.

High quality transport links, providing connections between where people live, work, receive education, shop and take part in leisure activities are fundamental to allow the city to grow in such a way that is economically and environmentally sustainable and socially equitable.

Edinburgh already has a successful bus and tram network. Though bus patronage across Scotland has been falling over a sustained period, decreasing by a further 1.5% between 2017 and 2018, bus and tram patronage in Edinburgh has remained broadly stable. Edinburgh Tram opened in May 2014, and 7.3 million journeys were undertaken on Edinburgh Tram in 2019, a 10% increase on the previous year.

The current Covid-19 pandemic has had a profound impact worldwide. It is affecting the way in which our cities work, the way in which people live and travel and the longer-term impacts remain to be seen.

In the short-term, demand for public transport is a fraction of its previous level during the period of lockdown. The Scottish Government has provided support so that public transport services continue, ensuring that key frontline workers can travel to and from work and home during the pandemic.

There is a significant uncertainty around the impact of Covid; while vaccines efficacy is extremely promising, there remains the possibility of further waves through 2021 and beyond. Policy and behavioural responses will therefore be incremental and tactical as the situation continues to evolve.

In the medium term, it is expected that Covid will be controlled and, while it is likely that increased home working will reduce commuting demand, travel outside the peak periods may recover relatively quickly.

Longer term, the continued success and growth of the Edinburgh Region, in an inclusive and sustainable manner, will require the development and implementation of a coordinated approach to economic development, spatial planning and transport.

At a national level, this coordinated approach is being advanced through the Scottish Government's National Planning Framework and National Transport Strategy (NTS) and, in support of the NTS, the Strategic Transport Projects Review 2 (STPR2).

At an Edinburgh City level, the forthcoming City Plan 2030 (CP2030) will set out the spatial strategy and land allocations to 2030, which will be supported by the City Mobility Plan (CMP). The Edinburgh Strategic Sustainable Transport Study (ESSTS) had the remit to examine strategic transport corridors within, and potentially beyond, Edinburgh to assess whether, and how, the development of transit-led solutions could deliver against stated transport objectives and support wider policy outcomes such as sustainable economic growth, reducing carbon, promoting equity and supporting healthier lifestyles.

The consideration of transit options will inform elements of the CP2030 by identifying where tram or bus rapid transit (BRT) has the potential to support housing, employment and mixed-use development in a sustainable manner. Transit proposals have also informed elements of the CMP so that the CMP's policies and initiatives are mutually reinforcing with any transit solutions, such that the transport system as a whole is best able to address key challenges and deliver policy outcomes.

The regional dimension is important. Edinburgh is the hub of a sub-regional economy that extends north (to Fife), west (to West Lothian and Falkirk), east (to East Lothian) and south (to Midlothian and the Scottish Borders). There is significant commuting into Edinburgh from these areas (and within and between these areas) and these areas also support significant employment which, in turn, create complex demands for

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<sup>1</sup> National Records of Scotland population projection, March 2018

movement. Spatial planning therefore must also be coordinated at a sub-regional level, through SESPLAN and it follows that transport must be considered at a sub-regional level.

In summer 2020, City of Edinburgh Council commissioned Phase 2 of the ESSTS, which considered two strategic transit corridors in greater detail, presenting a route alignment from Granton in the north of the city to Shawfair in the southeast. This report summarises the outcomes of this second phase of the work.

## **1.2 Purpose of this Study**

The purpose of the study was fivefold:

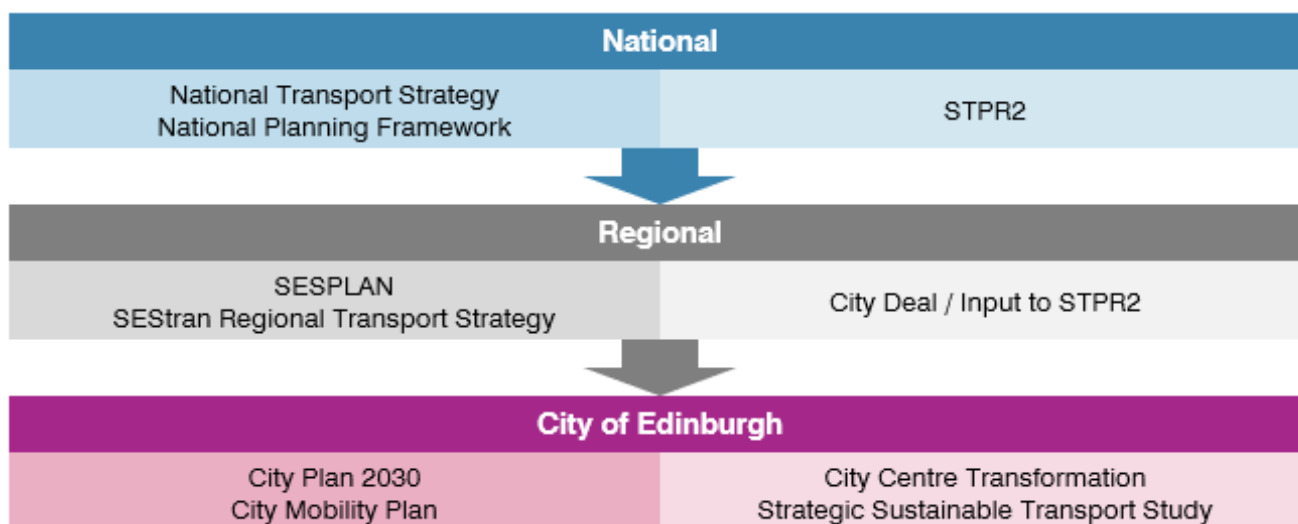
- To establish and confirm objectives and ensure continued alignment to existing and emerging national, regional and local policy;
- Consider two corridors identified as having a high level of potential for strategic transit in greater detail, taking initial feasibility considerations made during Phase 1 and exploring these in greater detail in terms of viability and deliverability;
- Consider how an integrated solution could be developed for strategic transit and active travel and how current best practice approaches to design and implementation could be utilised to facilitate this integration;
- To define what extension of the transit system in Edinburgh would look like in terms of high quality tram or bus based rapid transit options; and
- Provide recommendations for next steps in the development of the transit business case.

## 2. Policy Context

### 2.1 Introduction

This chapter provides a short summary of current policy context. Key national, regional and local policies are summarised in Figure 2.1.

**Figure 2.1: Policy Framework**



### 2.2 The National Policy Context

#### 2.2.1 National Planning Framework

The Third National Planning Framework (NPF) sets out a long-term vision for development and investment across Scotland over the next 20 to 30 years. It is the spatial expression of the government economic strategy and plans for infrastructure investment.

The strategy for a successful, sustainable place highlights the particular scope for the cities network to progress the country's economic agenda. To this end, the Scottish Cities Alliance and local authorities will take forward the priorities set out in the City Investment Plans.

The Scottish Cities Alliance will bring the City Investment Plans together into a shared investment portfolio brochure, communicating a consistent investment message across the cities network.

As an early priority, the Scottish Government will examine current planning authority approaches to aligning planning and infrastructure investment to inform whether further advice on this is required. The Scottish Government will also work with the Cities Alliance to progress Smart Cities initiatives.

#### 2.2.2 National Transport Strategy 2

The National Transport Strategy 2 (NTS2) was published in February 2020. The overarching vision is:

*We will have a sustainable, inclusive and accessible transport system, helping deliver a healthier, fairer and more prosperous Scotland for communities, businesses and visitors.*

The priorities to support the vision are:

- Reduces inequalities
- Takes climate action
- Helps deliver inclusive economic growth
- Improves our health and wellbeing

Although these were set pre-Covid, they have remained relevant during the pandemic and are central themes supporting economic recovery.

Transport Scotland has prepared a 'Transport Transition Plan' with targeted initiatives aimed at adapting transport systems as part of the Scottish Government's strategic response to Covid. A focus on local work, life and leisure activities has seen a strong shift to active modes while at the same time there has been a significant reduction in public transport journeys. The transition plan seeks to support public transport through revenue support and new priority measures, while limiting the negative impacts of a potential increase in car use.

### 2.2.3 Strategic Transport Projects Review 2 (ongoing)

The Strategic Transport Projects Review 2 (STPR2) will help inform transport investment in Scotland for the next 20 years. It will help to deliver the vision, priorities and outcomes for transport set out in the National Transport Strategy (NTS2) and will align with other national plans such as the National Planning Framework (NPF4) and the Climate Change Plan.

The aims of STPR2 are:

- to conduct a whole-Scotland, evidence-based review (in accordance with Scottish Transport Appraisal Guidance or STAG) of the performance of the strategic transport network across all transport modes against clear criteria on operational performance, safety, and environmental impact, whilst fundamentally supporting Scotland's Economic Strategy, including inclusive growth. Outcomes will be defined in the emerging and updated NTS2; and in so doing,
- to make recommendations for potential transport investments for Scottish Ministers to consider as national investment priorities in an updated 20-Year Infrastructure Investment Plan for Scotland.

The STPR2 study will:

- recommend to Transport Scotland a programme of interventions for the period 2022 to 2042 which will make a significant contribution to delivering the new NTS2;
- ensure that the outcomes of STPR2 align with other Scottish Government national plans, policies and strategies, the National Planning Framework, the Climate Change Plan and will consider the commitments made to City and Regional Growth Deals; and
- use the established STAG methodology, to re-consider the extant recommendations of the first STPR and other candidate interventions in the light of NTS2 policies as part of the initial optioneering exercise.

As a result of the Covid-19 Pandemic, the STPR2 is taking a two phased approach. Phase 1 reported on the 3<sup>rd</sup> February 2021; Phase 2 will report later in the year.

## 2.3 The Regional Policy Context

### 2.3.1 SESplan (South East Scotland Strategic Development Plan)

The Strategic Development Plan (SDP) sets out a spatial strategy which seeks to promote a secure and sustainable pattern of growth.

SESplan2 proposed an updated spatial plan but this was rejected by Scottish Ministers in May 2019. As a result, SDP1 (approved 2013) remains current; it is the approved strategic plan and reflects the ambitions and commitment of the six authorities (Edinburgh, Midlothian, West Lothian, East Lothian, Fife and Scottish Borders) to realising the potential of the area and ensuring it continues to play a leading role in a national context.

The SDP provides a framework for the six LDPs in the SESplan area to allocate sufficient land for housing development to ensure that the area's overall assessed housing requirements can be met by new house completions.

Many housing development sites are either within Edinburgh or within the city's commuter catchment. This has significant implications for transport demand and commuting, placing pressure on road and rail networks in particular. In addition, there are four Strategic Development Areas located within Edinburgh - the city centre, West Edinburgh/ Edinburgh Airport, the BioQuarter and Waterfront. A further 9 are in the other SESplan local authority areas.

Transport and public accessibility have been key in developing the spatial strategy for the region. The plan recognises that existing commuting patterns by public transport are focused on the city centre; proposed

transport improvements seek to help address this, including trams to Newhaven, Tram Line 3, A720 Orbital Bus and A90 corridor improvements.

### 2.3.2 SEStran Regional Transport Strategy (2015 Refresh)

The SEStran Regional Transport Strategy (RTS) provides a strategic framework for transport management and investment for the partnership area over a 10-15 year period. Originally approved in 2008, a refresh was approved by the Scottish Government in July 2015.

The vision of the strategy is the 'development of a transport system which enables businesses to function effectively, allows all groups in society to share in the region's success through high quality access to services and opportunities, respects the environment and contributes to better health'.

Regional Transport Strategy Objectives have been developed under the four main categories covered in the overarching Vision Statement: Economy, Accessibility, Environment, and Safety and Health.

Key themes covered by the strategy include:

- Connectivity - the need for a sustainable approach, supporting the long-term competitive position of the area through resource efficiency, social inclusion and minimum environmental impact.
- Region-wide measures – including influencing travel behaviour, smart ticketing, freight distribution, etc.
- Initiatives for specific groups – relevant to: access to healthcare, employment, public transport in rural areas and the needs of disabled people.
- Regional Transport Corridors - primarily concerned with targeting improvements in public transport towards the main regional corridors of commuting travel within SEStran and between SEStran and its neighbouring areas.

### 2.3.3 City Plan 2030

The City of Edinburgh Council has now started to prepare a new Local Development Plan, City Plan 2030. Choices, the statutory Main Issues Report stage of City Plan is informed by SDP1, the evidence base of SDP2 as appropriate, National Planning Framework 3 and outputs from the Edinburgh Strategic Sustainable Transport Study.

The demand assessment prepared for SDP2, together with more recent housing study work, provides the latest evidence base for allocating housing requirements to 2031. In addition, the Edinburgh Strategic Sustainable Transport Study (ESSTS) has helped inform site assessment, based on the current and potential (i.e. with transit improvement) transport accessibility and capacity across a long-list of potential sites.

A separate Transport Assessment is being undertaken to identify the additional infrastructure required to support the plan.

### 2.3.4 City Mobility Plan

The City Mobility Plan (CMP) supersedes the Local Transport Strategy for Edinburgh. It provides a strategic framework for proposed interventions aimed at helping the safe and effective movement of people and goods around Edinburgh whilst seeking to address associated environmental and health impacts. It comprises a series of objectives and policy measures under the headings of People, Place and Movement which will, collectively, achieve the Vision for the Plan:

"Edinburgh will have a greener, safer, inclusive and connected transport system delivering a healthier, thriving, fairer and compact capital city, and a higher quality of life for Edinburgh residents".

The Objectives of the plan are:

- People objectives seek to improve health, wellbeing, equity, and inclusion by: – Improving travel choices for all travelling into, out of and across the city; – Improving the safety for all travelling within the city; and – Increasing the proportion of trips people make by healthy and sustainable travel modes.
- Place objectives seek to protect and enhance our environment and respond to climate change by: – Reducing emissions from road transport; – Reducing the need to travel and distances travelled; and – Reducing vehicular dominance and improve the quality of Edinburgh's streets.
- Movement objective seek to support inclusive and sustainable economic growth by maximising the efficiency of Edinburgh's streets to better move people and goods.



### 2.3.5 Edinburgh City Centre Transformation

The vision of the Edinburgh City Centre Transformation (ECCT) Project has been to create a city centre for all, a place for people to live, work, visit and play. The vision also aims for a city centre that is a place that is at the heart of Edinburgh's communities, its cultural life, the focal point for its economy and one of Scotland's most iconic and important locations.

Through a series of engagement activities, the strategy proposes a wide range of interventions to provide a more liveable city centre in terms of active travel, public transport, traffic reduction and quality of open space. The strategy is supported by a detailed ten-year delivery plan.

- Across the whole of the city centre, the strategy will seek to deliver:
- A walkable city centre core right at the heart of the World Heritage Site, enabled by a pedestrian priority zone and a network of connected, high-quality, car-free streets;
- High-quality streets and public spaces where improvements allow for people to be inspired by the city's unique heritage while they interact, relax or play;
- A connected network across the city centre of new segregated and safe cycle routes to link communities and destinations, including the provision of a new walking and cycling bridge connecting the Old Town and the New Town; and

The strategy seeks to promote public transport through improved journey times and service reliability. Options explored include limited bus stop rationalisation, improved traffic signal sequencing and the rerouting of selected bus routes to improve core performance.

## 2.4 Current Issues and Challenges

### 2.4.1 City Centre Capacity

Transit has a key role to play in delivering the objectives of the City Mobility Plan and City Centre Transformation. The environment of major streets, including Princes Street and North and South Bridge, is heavily influenced by bus, creating a poor pedestrian experience.

The rapidly changing retail environment and the need to consider the purpose of the city centre provide an opportunity for change. Transit could help significantly reduce the number of buses on Princes Street and support the city's ambition to achieve Carbon Neutral status by 2030. Improved air quality, reduced noise and more space provide an opportunity to create a sense of place and an attractive environment in which to work, shop or dwell.

While Edinburgh's bus service is excellent, high levels of pre-Covid passenger demand meant that infrastructure had reached maximum capacity. On Princes Street, evening peak delays were significant, primarily driven by the number of buses waiting to queue at stops. Services patterns have already been split across multiple stops but there is no physical space to separate service patterns further. Pre-Covid, Princes Street was effectively catering for the maximum number of buses possible, leaving no room for further expansion.

How public transport can continue to serve a growing city is a concern and a key driver of the move towards Transit.

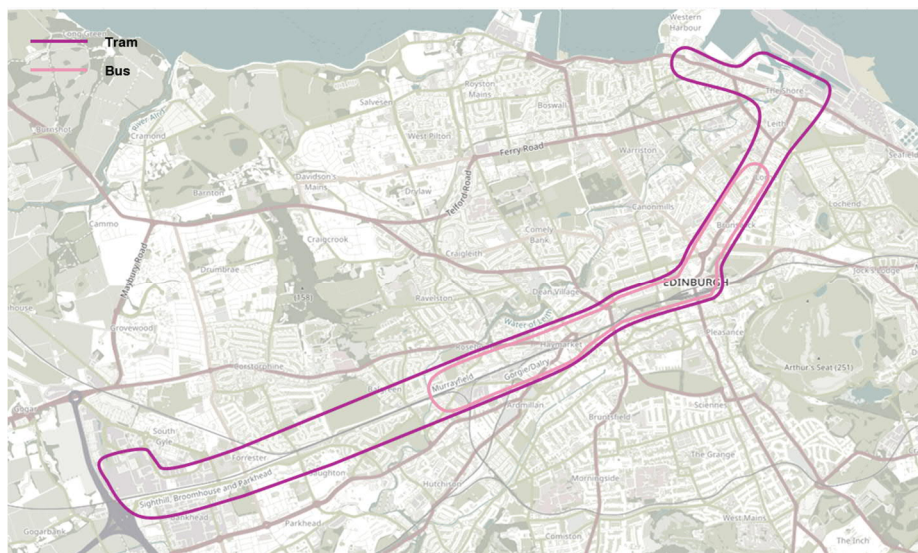
Clearly, Covid has a major impact on public transport demand through 2020 and the early part of 2021 with current demand at approximately 40% of pre-Covid levels. Nevertheless, demand can be expected to return towards normal as the impact of the pandemic recedes, particularly for interpeak and off-peak travel. Commuting trips may take longer to return; however, proactive and integrated transport policies are required more than ever to help encourage active and sustainable transport use.

### 2.4.2 Journey Times

Generally, bus journey times have slowed over the last 10 years and are increasingly uncompetitive and unreliable. The peak period 15 minute travel isochrone for bus is now much smaller meaning an increasing number of people choose to walk or cycle. While environmentally sustainable, slower journey times reduce fare revenue and increase operating costs.

The travel time from Portobello to the city centre is 50 minutes by bus, a distance of only 5km. Travel times from other local centres are consistent with this. Such times are not competitive with comparable cities, impacting on the economy and residents' quality of life.

**Figure 2.2: Bus and Tram 15 Minute Isochrone along Tram Corridor**



In order to attract inward investment, it is necessary that Edinburgh and South East Scotland has an efficient and effective public transport network. The BioQuarter and Waterfront locations are currently relatively poorly served by public transport. Delivery of a new transit line would show a commitment to these locations, encouraging investment. Tram has reduced the city centre to Edinburgh Park journey time from 50 to 15 minutes. It will reduce the peak hour public transport journey from the Foot of the Walk from 25 to approximately 10 minutes.

Similar journey time savings are possible along the route of future transit corridors.

Transit also has a significant role to play in improving sub-regional connectivity. As an example, providing an interchange with the Borders Railway at Newcraighall or Shawfair would help link Midlothian and the Scottish Borders to South East Edinburgh. New employment opportunities would be created together with improved sustainable access to the region's major hospitals.

## 2.5 Developing Study Objectives

It is essential that the ESSTS study is consistent and aligned with national, regional and local objectives. In this respect, the aim is not to develop 'new' objectives but to ensure alignment with those that have been or are currently in development.

Phase 1 objectives were previously defined based on a review of the current and emerging policies summarised above. Work indicated a very high degree of consistency across all policy documentation, around four key themes of Economy, Equality, Climate Action and Health/ Wellbeing.

Agreed objectives reflected and showed clear and explicit alignment to those of the City Mobility Plan as these are Edinburgh specific. The level of consistency between the CMP and regional/ national strategies meant that ESSTS Phase 1 aligned well at all levels.

Objectives are, to an extent, fluid and require to be reviewed and refreshed on an ongoing basis, in the light of project and policy changes. Indeed, the objectives in a number of previously reviewed policy documents had not yet been formally adopted, including: NTS2, CMP and STPR2.

As part of Phase 2, a full further policy review has been undertaken, capturing updates to national regional and local plans, policies and strategies. The review includes a summary of key themes and a compatibility assessment of previous objectives/ sub-objectives, with recommendations on those to take forward. Assessment themes are a mixture of Strategic Environmental Appraisal and Integrated Impact Assessment themes used for ECCT which are of relevance.

Ultimately, core objectives have been retained from Phase 1 but Phase 2 sub-objectives are more specific and measurable, reflecting the themes identified.

Table 2.1 summarises ESSTS core and sub-objective and relevant objectives from the NTS2, City Plan 2030 and CMP, emphasising close alignment across the strategic levels.

**Table 2.1: Objective Mapping**

NTS2	City Plan 2030	City Mobility Plan	ESSTS Core Objectives	ESSTS Final Sub-Objectives
Helps our economy prosper <ul style="list-style-type: none"> <li>• Will get us where we need to get to</li> <li>• Will be reliable, efficient and high quality</li> <li>• Will use beneficial innovation</li> </ul>	<ul style="list-style-type: none"> <li>• A city where everyone shares in its economic success</li> </ul>	<ul style="list-style-type: none"> <li>• to support inclusive and sustainable economic growth</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable economic growth and development</li> </ul>	<ul style="list-style-type: none"> <li>• Support sustainable and inclusive economic growth.</li> <li>• Encouraging opportunities for sustainable land use development through improved connectivity to and between Edinburgh's Strategic Development Areas.</li> </ul>
Promotes equality <ul style="list-style-type: none"> <li>• Will be affordable for all</li> <li>• Will be easy to use for all</li> <li>• Will provide fair access to the services we need</li> </ul>	<ul style="list-style-type: none"> <li>• A city in which everyone lives in a home which they can afford</li> <li>• A city where you don't need to own a car to move around</li> </ul>	<ul style="list-style-type: none"> <li>• to improve health, wellbeing, equity, and inclusion</li> </ul>	<ul style="list-style-type: none"> <li>• Improved equity &amp; social inclusion</li> </ul>	<ul style="list-style-type: none"> <li>• Improve connectivity and accessibility to jobs, education, healthcare and leisure.</li> <li>• Eliminate economic, geographical and social barriers to access through an inclusive and fair transport system.</li> </ul>
Improves our Health and wellbeing <ul style="list-style-type: none"> <li>• Will be safe and secure for all</li> <li>• Will enable us to make healthy travel choices</li> <li>• Will help make our communities great places to live</li> </ul>	<ul style="list-style-type: none"> <li>• A sustainable city which supports everyone's physical and mental wellbeing</li> </ul>		<ul style="list-style-type: none"> <li>• Improved health, wellbeing &amp; safety</li> </ul>	<ul style="list-style-type: none"> <li>• Promote sustainable and healthy lifestyles through improved active travel choices and provision.</li> <li>• Provide safe transit corridors which interchange efficiently with active travel links.</li> <li>• Reduce accidents and emissions from road transport through modal-shift to safer transit and active travel methods.</li> </ul>
Takes climate action <ul style="list-style-type: none"> <li>• Will adapt to the effects of climate change</li> <li>• Will help deliver our net-zero target</li> <li>• Will promote greener, cleaner choices</li> </ul>		<ul style="list-style-type: none"> <li>• to protect and enhance our environment and respond to climate change</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce transport related carbon emissions</li> <li>• Improved built &amp; natural environment</li> </ul>	<ul style="list-style-type: none"> <li>• Maximise the efficiency of our streets to encourage a shift to multi-modal and sustainable travel.</li> <li>• Reduce dependency on road transport to work towards net zero carbon emissions.</li> <li>• Improve the attractiveness of public transport through increased efficiency, journey time reliability and service quality.</li> <li>• Respect and respond to historic built and natural environment</li> <li>• Support wider enhancement to the public realm and streetscape through efficient and attractive interchange of transit and active travel methods.</li> </ul>

### 3. Option Assessment Framework & Process

#### 3.1 The Option Assessment Process

The option assessment process is summarised below.

- Step 1 - Corridor definition. The Granton and South East corridors were identified in Phase 1 of the study, which considered the potential for transit (across ten corridors) in Edinburgh to meet the policy objectives and outcomes described in Chapter 2. The Granton and South East corridors as those which had the greatest potential to be developed as transit corridors in the context of these objectives. While the objectives and sub-objectives for transit have been refined during this (Phase 2) study as summarised in Table 2.1, the outcome-led wider objectives are consistent.
- Step 2 - Option generation: As part of this study, the route options for each corridor were developed based on 'objective-led' drivers and engineering feasibility, key constraints and acceptability considerations.
- Step 3 – Option sifting (initial): Following development of options, a sifting process was undertaken, using a multi-criteria assessment. The purpose was to consider the options identified in Step 2 and to eliminate proposals that are either undeliverable (due to feasibility or acceptability considerations) or clearly sub-optimal based on objective-led and/ or deliverability criteria.
- Step 4 – This stage would involve more detailed assessment of the shortlist, entailing 'further sifting' within the same overall STAG compliant objective-led framework, to identify preferred option(s) as part of Strategic Business Case (SBC) development.

Throughout both Phases of the study to date (covering Steps 1 to 3) stakeholder input, review and challenge and 'buy-in' has been integral for the process. As such, within this study there has been agreement by the Technical and Steering Groups to the long-list of options developed (Step 2) and to the findings and recommendation on which of these options should be sifted out and those that should be taken forward (Step 3), subject to approval, to Strategic Business Case (Step 4).

#### 3.2 Consideration of Transit Modes

Edinburgh has an established tram operation between the Airport and the city centre (York Place) with the route currently being constructed through to Newhaven (the Tram Completion Project), due to open in 2023. The council also has powers (under the Parliamentary Act 2007) to construct the route to Granton via Roseburn, and has since the mid-2000s safeguarded routes to the South East serving Newcraighall and Sheriffhall respectively. Tram was therefore developed as a network concept.

However, much has changed since the mid-2000s in respect of the broader policy context, the use and utilisation of tram routes (e.g. the Granton corridor via Roseburn has developed to become a highly successful active travel corridor) and the development of plans and proposals that are material to the environment in which transit would operate (city centre transformation, development plans across the route).

These changes necessitate a full reconsideration of transit in terms of the strategic policy drivers of investment, the case for different transit route options, and of whether tram or another transit-based solution (e.g. BRT or 'trackless tram') is the most appropriate solution.

As part of this study we have therefore undertaken:

- A design and feasibility-led review to determine whether there is a feasible and deliverable tram option serving the Granton and South East corridors. This includes review of safeguarded routes and the identification of new route options which either overcome potential feasibility constraints and/ or have the potential to meet current objectives better.
- A review of transit technology options. This considers the range of current and emerging transit technology options, their key attributes, pros and cons and the urban environments in which they typically operate. The note sets out how technology development has supported the recent development of tram (e.g. catenary free operation, as recently introduced in the West Midlands), higher specification BRT (Sprint in Birmingham and Glider in Belfast) and the emergence of the trackless tram concept (including the piloting of fully electric, autonomous and optically guided AVR system in China).



The purpose of the two elements above are to sift down the better performing tram route options, and to undertake the initial modal technology review that will help inform the identification of modal alternatives.

As part of the further option development within the SBC an assessment of a preferred tram options would be compared with a BRT alternative specified to meet the same objectives (which may differ in terms of alignment due to different capability and constraints pertinent to modal alternatives). The modal alternatives will be assessed against the objective-led STAG criteria and in terms of economic performance.

### 3.3 Options Assessment Framework

A range of desirable outcomes can be achieved, against each of the five core ESSTS objectives and 12 associated sub-objectives and as summarised in Table 3.1. These outcomes enable strategic transit options to be assessed objectively using a range of associated metrics as described in this section.

At this stage/ for option assessment – these provide planning and objective-led considerations applied to the route alternatives

Route alternative analysis is focused on a simplified assessment – comparative performance vs objectives and deliverability.

**Table 3.1: Transit and Key Objectives**

Objective	Sub Objectives	The Role of Transit
Sustainable Economic Growth and Development	Support sustainable and inclusive economic growth.	<p>Transit can support through:</p> <ul style="list-style-type: none"> <li>Increasing connectivity between major employment centre, and encouraging new firms to invest and locate, further supporting the success of Edinburgh's high-value economy through increasing the clustering effects of key sectors (e.g. banking and finance, bio-science, legal and business services). This increased clustering increases overall productivity for all forms through 'agglomeration' benefits.</li> <li>Increasing business efficiency by reducing travel times.</li> <li>Transit and active travel also encourage modal-shift from cars, increasing the efficiency of the overall transport network and reducing the economic costs associated with congestion, accidents and emissions.</li> </ul>
	Encouraging opportunities for sustainable land use development through improved connectivity to and between Edinburgh's Strategic Development Areas.	<p>Transit can support through:</p> <ul style="list-style-type: none"> <li>Expanded labour market catchments, enabling businesses to recruit from a larger labour pool and giving workers greater access to jobs.</li> <li>This, in turn, can enhance the attractiveness of key employment locations as places where firms invest, locate and expand. High-quality public transport accessibility is key to supporting development and success of Edinburgh's strategic development areas where employment will be focused – the city centre, West Edinburgh, the BioQuarter and Waterfront. Active travel can increase overall accessibility, provide 'first and last mile' connections and enhance urban environment at key locations.</li> <li>Supporting the development of new housing/ mixed-used development in a sustainable manner. High-quality transit can increase the scale, rate, density and value (and hence viability) of development, by providing the accessibility, connectivity and capacity for growth. Active travel can support this and positively enhance the quality and attractiveness of communities.</li> </ul>
Improved equity & social inclusion	Improve connectivity and accessibility to jobs, education, healthcare and leisure.	<p>Transit can support through:</p> <ul style="list-style-type: none"> <li>Providing improved access to jobs, education, healthcare and leisure. Whilst public transport accessibility is generally good to the city centre, a transit network can open up opportunities for cross-city journeys. For example, the tram extension to Newhaven will significantly improve accessibility between Leith Waterfront (an area of high deprivation) and employment opportunities in West Edinburgh.</li> <li>Active travel can provide affordable accessibility and connectivity in corridors/ areas that are less well served by public transport.</li> </ul>
	Eliminate economic, geographical and social barriers to	<p>Transit can support through:</p> <ul style="list-style-type: none"> <li>A high proportion of lower income/ more deprived residents do not own or have access to a car; consequently, access to public transport is key to their ability to access jobs and services.</li> </ul>

Objective	Sub Objectives	The Role of Transit
	access through an inclusive and fair transport system.	<ul style="list-style-type: none"> <li>The affordability of public transport is an issue for many. Alongside future development of transit, consideration of a more integrated ticketing system which operates across public transport modes would support social inclusion.</li> </ul>
Reduce transport-related carbon emissions	Maximise the efficiency of our streets to encourage a shift to multi-modal and sustainable travel.	<p>Transit can support by:</p> <ul style="list-style-type: none"> <li>Encouraging modal shift from car journeys to public transport. High-quality transit can deliver substantial modal shift from car, particularly when this is paired with strategic use of Park &amp; Ride infrastructure, such as that currently in place at Ingliston. The mode shift potential of transit also increases as the network develops to offer a greater quality of service and more potential destinations. Active travel can enhance modal shift in transit corridors and also cater for demand/ movements that are less well served by public transport (e.g. orbital movements)</li> <li>Supporting sustainable housing and employment development such as increased density in urban areas and the development of brownfield sites. Higher density urban development reduces the need to travel and encourage shorter journeys and more walking, cycling and public transport usage. The carbon costs associated with providing associated infrastructure and services (electricity, waste, broadband etc) are also lower for higher-density urban development.</li> </ul>
	Reduce dependency on road transport to work towards net zero carbon emissions.	<p>Transit can support by:</p> <ul style="list-style-type: none"> <li>Encouraging modal shift from single occupancy car journeys to lower emission public transport. High quality active travel provision on transit corridors can enhance modal shift further resulting in additional emission reductions.</li> <li>Supporting sustainable housing and employment development such as increased density in urban areas and the development of brownfield sites encourages shorter journeys and more walking, cycling and public transport usage. The carbon costs associated with providing associated infrastructure and services (electricity, waste, broadband etc) are also lower for higher-density urban development.</li> </ul>
	Improve the attractiveness of public transport through increased efficiency, journey time reliability and service quality.	<p>Transit can support by:</p> <ul style="list-style-type: none"> <li>Providing an attractive option through delivering a high quality, direct, reliable, fast public transport.</li> <li>Transit can provide greater efficiency where high quality high capacity services operate on corridors with higher demand.</li> <li>Transit can provide more efficient – in terms of cost-effectiveness and utilisation of capacity/ road-space – public transport solutions in the city centre, linked to the City Centre Transformation aims of reducing buses in the city centre and in particular along Princes St.</li> <li>Transit attractiveness and efficiency can be increased where expanded networks provide for greater operational efficiency for transit, greater attractiveness to users (e.g. cross-city trips) and greater ability to consider wider public transport network integration.</li> </ul>
Improved built & natural environment	<p>Protect and enhance the character, integrity and liveability of the built and natural environment</p> <p>Or</p> <p>Respect and respond to historic built and natural environment</p>	<p>Transit can support by:</p> <ul style="list-style-type: none"> <li>Edinburgh City Council has developed an ambitious plan for City Centre Transformation, focused on enhancing the quality of the city centre environment for all users, and prioritising the role of streets as 'destinations' rather than solely for 'movement'. The City Centre Transformation strategy and enhancement of 'place' across the city has the needs of pedestrians and cyclists at its core. The development of transit solutions can be an enabler of this vision by reducing traffic dominance in car and bus-centric locations, thereby assisting in the delivery of the City Centre Transformation Vision. At the individual street level, transit can be integrated within an enhanced streetscape.</li> <li>For development locations along the route, transit can support the delivery of housing and mixed-use developments at a higher density and rate than would otherwise have been the case. Such density can support increases in local public services (e.g. schools, health facilities, community facilities) and other activity (shops and services) that all contribute to improving resident quality of life and visitor experience.</li> </ul>

Objective	Sub Objectives	The Role of Transit
	Support wider enhancement to the public realm and streetscape through efficient and attractive interchange of transit and active travel methods	<p>Transit can support by:</p> <ul style="list-style-type: none"> <li>Facilitating improvements to the built environment/public realm alongside new transit infrastructure provision to support pedestrians.</li> <li>Key opportunities where transit can provide and enable opportunities for the enhancement of public realm and the pedestrian environment include the city centre, inner section of the South East corridor and through the integration of transit and major development areas throughout the route.</li> <li>Transit and its infrastructure requirements can also impact upon the urban environment, particularly in sensitive (e.g. heritage assets) locations. This impact forms part of any assessment and the route/ alignment development process, and mitigation.</li> </ul>
Improved health, wellbeing & safety	Promote sustainable and healthy lifestyles through improved active travel choices and provision.	<p>Transit can support:</p> <ul style="list-style-type: none"> <li>The city centre, where the overall CCT strategy is focused on improving facilities for pedestrians and cyclists, hence supporting healthier lifestyles.</li> <li>Where transit is developed alongside corridors that have strong existing public realm and active mode provision. This was the case for the Newhaven (Tram Completion) project and would be the case for Granton.</li> <li>Where there is the opportunity to provide wholly new or fundamentally upgraded transit and active mode provision in proposed transit corridors. This might be the case for potential transit extensions to the West of Edinburgh Park.</li> <li>Transit can also reduce accidents and emissions at a broad spatial level (through modal shift and reduced car kilometres travelled), and through integrated design of transit/ active modes provision involving the reduction of traffic on transit corridors and associated reductions in localised emissions and accidents.</li> </ul>
	Provide safe transit corridors which interchange efficiently with active travel links.	<p>Transit can support:</p> <ul style="list-style-type: none"> <li>Through provision of active travel and transit routes which are adequately segregated to ensure safety for those using them.</li> <li>Through ensuring transit stops are connected to the wider active travel network in the city.</li> <li>Through provision of high quality cycle parking at transit stops to allow longer trips to be undertaken via a combination of transit and active travel.</li> <li>By providing good access to transit stops on foot or by bike.</li> </ul>
	Reduce accidents and emissions from road transport through mode-shift to safer transit and active travel methods.	<p>Transit can support:</p> <ul style="list-style-type: none"> <li>By providing an attractive alternative to car based trips along the Granton and SE Edinburgh Corridors which will encourage mode shift to safer, lower emission transit modes.</li> <li>By providing associated safe high quality segregated active travel infrastructure where possible to allow safer active travel trips.</li> <li>By supporting reduced traffic level overall, making walking and cycling safer in the city.</li> </ul>

### 3.4 Overview of Assessment Framework

An option assessment framework has been developed, consistent with Scottish Transport Assessment Guidance (STAG). The purpose of the framework is to enable an objective-led assessment of alternative transit alignments. The process informs decision making and provides a record of the methodology applied.

Alignment options have been assessed based on a simplified, proportionate framework, based on the available evidence. The framework captures key drivers (success factors) including relative scheme cost and journey time, a qualitative assessment of potential passenger demand, the study objectives, deliverability criteria and indicative financial and economic performance.

There are essentially three elements of the assessment:

- Objective-led criteria - How well do options meet the agreed objectives?
- Deliverability criteria – Is the option deliverable

- Affordability and Value for Money – Is the option likely to be operationally affordable and represent value for money (are benefits likely to justify costs)?

Certain alignment options can be ruled out based on this early sifting exercise. Other alignment choices are more complex and will require further technical analysis and option development as part of the development of the strategic business case.

Assessment framework indicators are summarised below.

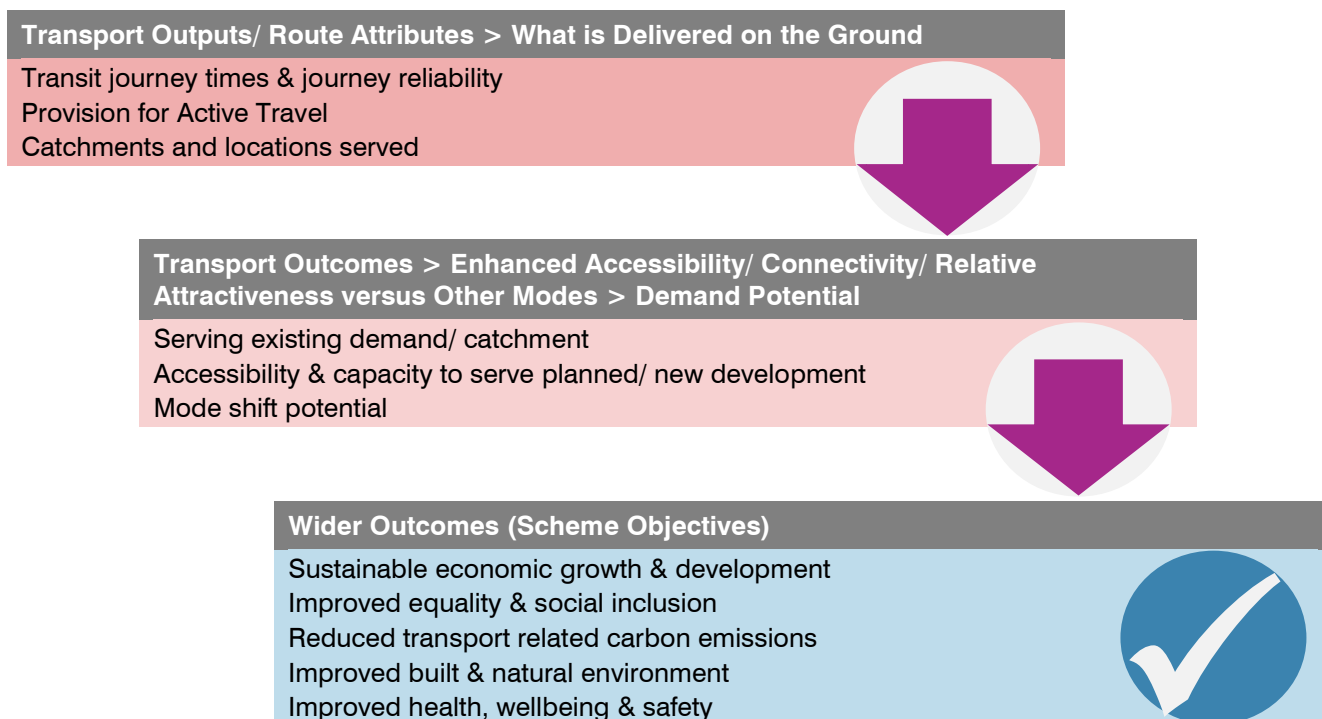
### 3.5 Objective-Led Criteria

Though simplified and proportionate, the framework adopted is based on the assessment of options performance against the five outcome-led objectives set out in Table 2.1. These are assessed, with the assessment framework, at the level of these objectives, through the consideration of how transit supports the range of sub-objectives. The assessment framework also employs the principles of logic mapping to inform the assessment by making the linkages between:

- Transport outputs - the attributes that transit will deliver in terms of journey time and journey time reliability.
- Transport outcomes – how these attributes provide improved accessibility, connectivity, capacity and quality which will, in turn, drive the success of the proposal in demand terms. The way in which options provide for different demand catchments (existing demand areas, planned/ future development, attracting modal shift) will affect the nature and scale of how each option contributes to the five scheme objectives.

This is illustrated in Figure 3.1.

**Figure 3.1: Transport Outputs, Outcomes and Wider Outcomes**



#### 3.5.1 Comparative Cost and Journey Time

A high-level assessment of comparative option capital costs has been undertaken, based on key route attributes such as route length and whether the route is running in more challenging (e.g. central areas) sections, but also informed by where there are specific issues (utilities, land costs, structures, environmental mitigation) that will affect costs.

Full cost estimates have not been prepared; instead, the assessment is comparative in nature, informed by the considerations above and where there is a clear difference in the costs between options.



Journey times have been estimated, for each option, based on a run-time model which takes account of each section of route and whether transit would run in fully segregated sections, partially segregated or mixed with traffic. The run-time model has been validated against the exiting tram network and the forecast run-times on the Newhaven (Tram Completion Project) section.

Consideration of comparative journey times (and journey time reliability) has informed the assessment of objective-led criteria (as described above) and of the operational affordability, in that comparative tram journey times will have a broadly proportionate relationship with comparative operating costs.

Criteria are based on a qualitative assessment of the comparative capital cost and journey time of each option. Each option is ranked with '1' being the lowest capital cost, or shortest journey time.

### 3.5.2 Demand Potential

Potential transit passenger demand has been scored +1 to +3, based on each alignment's ability to:

- serve existing demand/ catchment
- serve new development
- attract modal shift

### 3.5.3 Objective and Outcome-led Criteria

Each alignment has next been ranked +3 to -3 against the study objectives:

- Sustainable economic growth & development
- Improved equality & social inclusion
- Reduced transport related carbon emissions
- Improved built & natural environment
- Improved health, wellbeing & safety

Again, scores are qualitative. Ranking against sustainable economic growth & development is informed by the adjacent population and the potential to support growth through improved public transport links. Improved equality and social inclusion is based on SIMD indicators, reduced transport related carbon emissions is a function of expected patronage and mode shift.

An assessment of the impact of the scheme on the built and natural environment is based on the physical impacts and how well these can be integrated into the cityscape. Improved health, wellbeing and safety is partly informed by how well alignments provide access to the city's two major hospitals.

## 3.6 Deliverability Criteria

It is recognised that at an early stage, the assessment is not based on a detailed assessment of impacts. Rather, the assessment adopts a risk-based approach and essentially poses the question 'what is the risk that option X will be undeliverable due to critical success factor Y?'.

The risk is assessed on a Red, Amber, Green (RAG) rating, whereby red is high risk and green low risk. Due to the scale and nature of most options, relatively few options are assessed as 'low risk' across a range of criteria. This reflects the inherent challenges that larger schemes face, especially if there is a requirement to go through powers and consents processes to secure powers for compulsory purchase. Deliverability criteria are a risk-based Red (3)/ Amber (2)/ Green (1) assessment; a Red score is high risk and represents a potential showstopper. The deliverability criteria considered are:

- Infrastructure deliverability - Is the option technically feasible?
- Operational deliverability - Is the option operationally feasible and does it present operational challenges?
- Environmental impact - Is the option likely to have environmental impacts that affects its deliverability or acceptability?
- Powers and consents – Does the option require powers? What is the level of risk in successfully securing powers?
- Land and property impact - Is the option likely to have land and/ or property impacts that affects its deliverability or acceptability?

- Stakeholder acceptability - Does intervention require the support or acceptance of the stakeholders required to facilitate delivery?
- Implementation disruption - Is the option likely to have significant and potentially unacceptable disruption impacts?
- Impact on other modes – Does the option have potentially adverse and unacceptable impact on other modes?
- Other dependence - Is the option dependent on another scheme/ policy etc.?

Significant barriers to deliverability have been considered including operational issues which might limit the effectiveness of the scheme. The environmental impact of the scheme on the Roseburn corridor is especially sensitive and a high level review of key issues has been undertaken.

Powers and consents, land and property impact and stakeholder acceptability are all assessed.

Implementation during construction considers the buildability of each alignment option. The Impact on other modes criteria is intended to identify whether there is a lasting impact on bus or active travel which might reduce operational reliability, journey time or attractiveness.

Other dependence seeks to capture whether the scheme is reliant on other interventions to enable delivery.

### **3.6.1 Financial/ Economic Performance**

As part of any future business case an assessment of financial and economic performance will be required.

Financial performance essentially captures whether the revenue the system generates is likely to cover the system costs, and therefore be financially sustainable without the need to ongoing subsidy.

Economic performance measures whether the overall benefits of the scheme exceed the overall costs, over the lifetime of the project. This is based on cost-benefit analysis, for which there are established approaches and guidance.

A bespoke economic assessment (i.e. cost-benefit analysis) or financial assessment has not been prepared as part of this commission, as detailed costs and demand and revenue forecasts have not been estimated. However, the comparative option costs and comparative demand/ revenue potential of each option has been considered and, on this basis, it has been possible to identify where options are likely to out-perform alternatives in respect of their financial and economic performance.

The economic and financial performance have both been undertaken on a risk-based RAG assessment, which assesses the scale of challenge an option is likely to face in achieving an acceptable economic performance, and hence to meet funding criteria and to be financially sustainable (ongoing affordability).

In most cases the level of evidence is limited at this stage, so the risk has been identified as 'amber'. However, in some cases the cost and demand drivers are such that we are able to highlight a potential showstopper risk or clearly asset that an option is sub-optimal in terms of financial and economic performance.

## 4. Transit as part of an Integrated Corridor Solution

### 4.1 Introduction

Transit solutions must be developed as part of an integrated corridor approach. At a city-wide level, the City Mobility Plan and City Centre Transformation Strategy set a clear hierarchy for travel modes with walking at the top of the chain, followed by cycling, public transport, goods and finally private vehicles. How this hierarchy is best catered for at a corridor level requires careful consideration.

Each mode has a set of requirements which inform the specification of a high-quality integrated corridor solution. Clearly trade-offs between competing demands exist and an integrated approach is needed to deliver the best infrastructure solution to achieve the desired objectives.

### 4.2 Guiding Principles for Option Development

Guiding principles aim to ensure routes include the attributes and design parameters that allow transport outputs and wider outcomes to be achieved.

The development of design parameters for transit has been informed by our understanding of what makes a successful transit system, and critically of the broader objectives for people and movement within the city and its key corridors. We will therefore start from the perspective that it is imperative that the development of transit integrates with the wider vision for transport, the mode hierarchy and the vision for the city centre articulated through the CCT.

In this regard, consideration has been given to:

- The priorities and requirements for the development of active travel corridors;
- The needs for pedestrian movement and space;
- Quality of public space and urban realm.

These considerations have informed the development of key design parameters which have informed the transit route option development and the key parameters and assumptions pertaining to other modes and utilisation of limited road space. How transit will be developed as part of an integrated corridor solution is described below.

#### 4.2.1 Integration of Active Travel and Transit

Active travel provision will be a core element of the design of each transit corridor. The development of complementary design principles for active travel has been informed by our understanding of what makes a successful active travel network. We will therefore start from the perspective that it is imperative that the development of active travel integrates with the wider vision for transport, the mode hierarchy and the vision for the city centre articulated through the CCT.

In this regard, consideration has been given to the priorities and requirements for the development of active travel alongside transit to ensure appropriate capacity is provided for both current active travel volumes and aspirational levels for the future.

Key design parameters for transit will include:

- Capacity to meet current and predicted demand based on the aspirations for the city;
- Provision of infrastructure that is safe for cyclists and pedestrians through appropriate segregation. Generally, this will be on the same corridor as transit, but towards the city centre it may be necessary to make dedicated provision on a parallel street - examples include North/ South Bridge and Dean Bridge;
- High quality active travel infrastructure that meets the most recent guidelines. Where transit is proposed along existing routes, replacement facilities will be designed in accordance with current guidance (LTN 1/20, Cycling by Design and Edinburgh Street Guidance);
- Integration of active travel with transit and other modes (for example considering permeability of the local area for pedestrians accessing transit to reduce potential severance impacts) and development of mobility hubs at key points on the network;
- Stop accessibility will be carefully considered to create safe and attractive links, ensuring that the network is (and feels) accessible to all. Interchange between cycling and transit will be made as seamless as

possible with appropriate rack facilities provided at key nodes, where space allows. Close to the city centre, cycling is quicker than other modes and so interchange demand is likely to be low. Wider strategic interchange locations, where additional infrastructure is essential, will be identified as part of a detailed appraisal.

#### 4.2.2 Integration of Public Realm and Transit

Transit provides an opportunity for a step-change in public realm, supported by traffic and demand management measures below. Transit would enable wider footways, providing more pedestrian space, particularly around major junctions. New attractive and distinctive spaces, with appropriate planting and wayfinding, could be created, supporting local shops and enterprise.

Transit provides the catalyst for investment in communities which might otherwise have been overlooked and, as a result, supports local economic growth.

To support tram through the Bridges corridor, it will be necessary to consider the operation of local streets. It is likely that the level of through traffic will require to be reduced or removed entirely. Demand management interventions can help reduce total traffic but a percentage of vehicles will still need to be diverted. Where to and how will need careful consideration and mitigation.

Servicing and loading arrangements will require careful design in order to support businesses and local residents. Kerb space is at a premium and transit designs will need to accommodate bus and transit stops in addition to the active travel ambitions summarised above.

#### 4.2.3 Land Use and Integration of Transit with Major Developments

A higher level of development density is supported by transit and this in turn helps support the need for transit. This virtuous circle is at the heart of the development of sustainable cities. Higher density development supports local shops, restaurants and promotes a sense of place. Reduced travel distances and clean and fast public transport connectivity compliment active travel. Together, these elements can help ensure Edinburgh meets its commitment to be carbon neutral by 2030.

In many cities, international investment has been targeted towards locations with excellent transport and communication links. By comparison, Edinburgh's BioQuarter and Waterfront sites are poorly served by fast public transport. Delivering new transit connectivity shows commitment and investment by city and government, helping to drive external investment, economic growth and employment.

#### 4.2.4 Bus/ Rail Network Integration

Transit has the potential to provide a step change in sub-regional connectivity. Delivering interchange with the Borders Railway would link Midlothian and the Scottish Borders to South East Edinburgh. It would provide new employment opportunities from and to the south of the city region, which until recently suffered from extremely poor public transport accessibility. A Granton to Borders Railway transit corridor would serve the regions two major hospitals. Compared with bus, transit is a more legible mode of transport, and so is especially suited to the elderly, persons with a disability or with young families.

New hubs and multi-modal interchanges could be built around transit. Sites at Shawfair/ Newcraighall and Sheriffhall can help drive mode shift towards public transport. Transit journey times are competitive with car and so these locations would perform better than existing facilities to the southeast of the city, which have tended to underperform.

CEC's proposals to integrate bus and tram operations provides an opportunity to reconfigure public transport delivery to better consider the wider economic and growth needs of the city and region. This has the potential to support smart and integrated ticketing across multiple public transport and potentially other modes.

#### 4.2.5 Multi-Modal Hubs and Interchange

In addition to interchange at rail stations as indicated above, traditional Park & Ride, and more innovative multi-modal hubs (or mobility hubs) provide an opportunity to provide an interchange point for private car, local bus services, potential shared mobility options (such as shared bikes and car clubs) and traditional active travel modes. In principle these modes would serve local catchments and less dense urban areas and channel demand into transit to provide frequent, direct, fast, low emission connections into the city centre and other key demand drivers along the strategic transit route. Present examples include Sheriffhall Park & Ride, but further



aspirations within the City Mobility Plan, as well as outcomes from SEStran's Mobility Hub Strategic Study and Park & Ride study, indicate the potential for further sites.

Mobility hub location impacts on the typology of the hub in terms of what interchange options are available and what additional facilities are provided (e.g. basic information and waiting areas to retail, parcel collection and electric vehicle charging).

Rail stations (such as Shawfair and Newcraighall) also present opportunities for development of mobility hubs.

#### 4.2.6 Traffic Management

In order for the transport network to have capacity for transit, demand management measures will be required in specific areas where capacity and tram conflicts will be a particular issue. Demand management would include options such as physical restraint (removal of parking, through traffic, traffic calming/ 20mph), reallocation of road-space, traffic management, review of access and servicing arrangements. It is assumed demand management would be particularly applicable along on-street sections of the route including the Bridges/ Southside and Dean Bridge/ Orchard Brae/ Crewe Road South corridors.

#### 4.2.7 Summary

Table 4.1 provides a summary of the key output requirements and design principles/parameters to deliver an integrated corridor solution where transit is integrated into the wider transport hierarchy.

**Table 4.1 Summary of Key Requirements**

Mode	Output Requirements	Design Principles/ Parameters
Transit	<ul style="list-style-type: none"> <li>Competitive and reliable journey times</li> <li>High quality – frequent, safe, comfortable</li> <li>Serving and connecting major origins and destinations</li> <li>Provide capacity to support current and future demand</li> </ul>	<ul style="list-style-type: none"> <li>Meet tram design standards throughout</li> <li>Segregation where possible, high-levels of priority, minimise mixed running</li> <li>High quality vehicle and stop infra, high frequency</li> <li>Serving key locations on route – providing attractive connections between them</li> </ul>
Active travel <sup>2</sup>	<ul style="list-style-type: none"> <li>Attractive/ Direct/ Legible/ Safe/ Comfortable</li> <li>Provide capacity to support current and future demand</li> <li>Provide interchange between active travel corridors and transit</li> </ul>	<ul style="list-style-type: none"> <li>Meet Active Travel design standards throughout</li> <li>Fully segregated where possible, high-levels of priority</li> <li>Corridor capacity through delivery of at least minimum width [segregation] and more where possible operating on same route as tram</li> <li>Identification of viable and attractive active travel routes where space on transit corridor limits ability to provide segregation of active travel</li> </ul>
Public realm <sup>3</sup>	<ul style="list-style-type: none"> <li>Welcoming, inclusive and accessible to all</li> <li>Easy to navigate</li> <li>Attractive and distinctive</li> <li>Give priority to sustainable travel</li> <li>Safe and secure</li> <li>Make the most of Edinburgh's historic inheritance</li> <li>Designed to deal with and respond to environmental factors such as sun, shade,</li> </ul>	<ul style="list-style-type: none"> <li>Meet Edinburgh Design Guidance standards.</li> <li>Provide clear wayfinding information at stops.</li> <li>High quality design that is sympathetic to the local built environment.</li> <li>Disability Discrimination Act (DDA) compliant.</li> </ul>

<sup>2</sup> National core design principles

<sup>3</sup> Edinburgh Design Guidance 2017, p116

Mode	Output Requirements	Design Principles/ Parameters
	<p>wind, noise, air quality and flood risk. Regarding the latter, CEC policies support above ground storage to enhance place-making, including rain gardens</p> <ul style="list-style-type: none"> <li>• Respect key views, buildings and spaces reflect the needs of local communities</li> <li>• Are resilient, cost-effective and have a positive impact on the environment over their life-cycle</li> </ul>	
Bus	<ul style="list-style-type: none"> <li>• Reliable journey times</li> <li>• High quality – frequent, safe, comfortable</li> <li>• Serving and connecting local communities to transit.</li> </ul>	<ul style="list-style-type: none"> <li>• Transit has priority over bus.</li> <li>• Bus network reviewed to provide capacity for transit and to integrate with transit network.</li> </ul>
Multi-modal Hubs	<ul style="list-style-type: none"> <li>• Serving and connecting local and regional communities to transit via a range of sustainable modes.</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of appropriate multi-modal options</li> <li>• Provision of supporting infrastructure e.g. high quality waiting, retail, EV charging</li> </ul>
Land Use Integration	<ul style="list-style-type: none"> <li>• Transit orientated development</li> <li>• Sustainable, high densities</li> </ul>	<ul style="list-style-type: none"> <li>• Accessibility to transit/good pedestrian/cyclist permeability</li> <li>• Safe and secure</li> <li>• High quality public realm</li> </ul>
<b>Enablers</b>		
Bus Network	<ul style="list-style-type: none"> <li>• Reliable journey times</li> <li>• Network capacity for transit</li> <li>• Access to transit</li> </ul>	<ul style="list-style-type: none"> <li>• Bus network re-configured to 'feed' transit via ALEO</li> <li>• Smart &amp; Integrated ticketing</li> </ul>
Traffic Management	<ul style="list-style-type: none"> <li>• Reliable journey times</li> <li>• Capacity for transit</li> </ul>	<ul style="list-style-type: none"> <li>• Delivery and servicing planning/review requirements</li> <li>• Road space re-allocation</li> <li>• Remove parking</li> </ul>

## 5. Granton Corridor – Options and Option Assessment

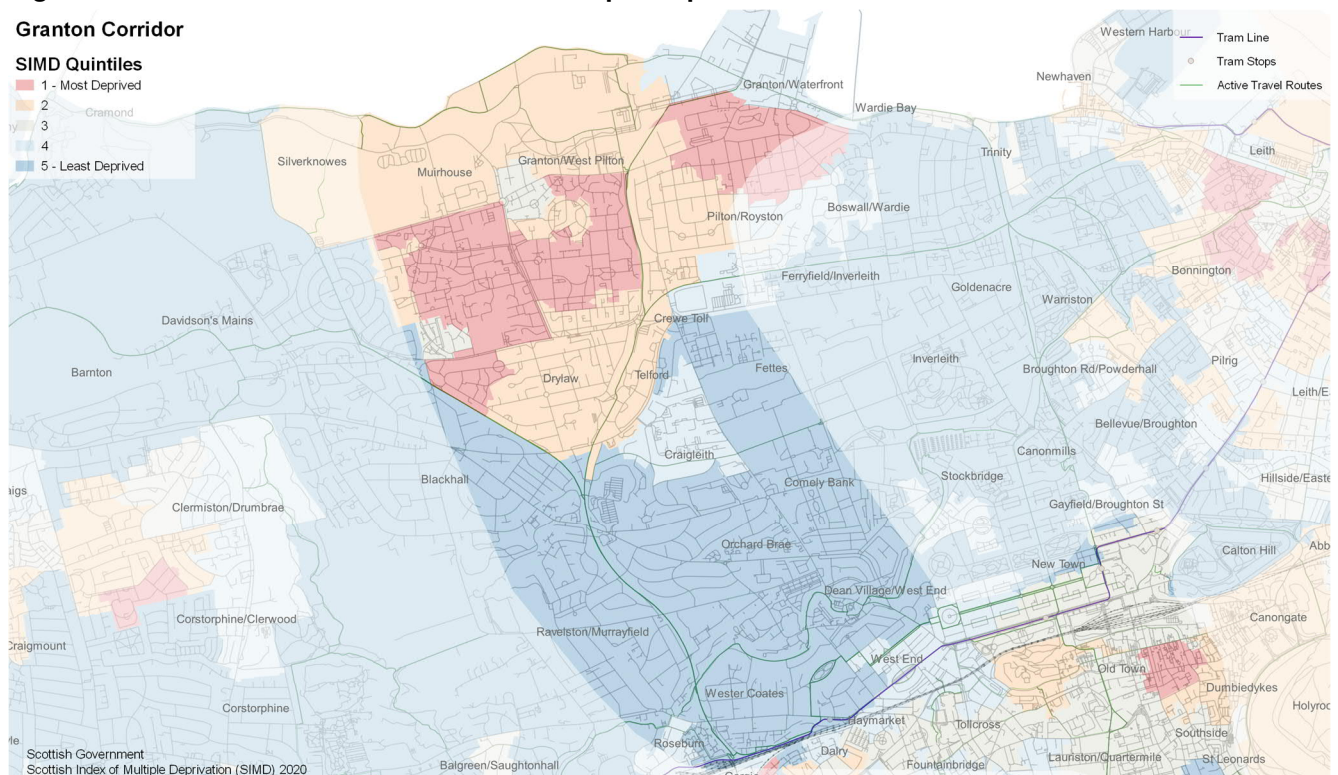
### 5.1 Corridor Overview

#### 5.1.1 Introduction

This corridor connects Granton in the north of Edinburgh to the existing tram network in the city centre. It is characterised by established residential areas such as Pilton, Muirhouse and Ravelston. In addition, major residential development is proposed on former industrial land around Granton Waterfront.

The areas around Pilton and Muirhouse are some of the most deprived in Edinburgh. Further south, around Orchard Brae and Ravelston, communities are some of the most affluent in the city. Figure 5.1 shows Scottish Index of Multiple Deprivation (SIMD) quintiles in north Edinburgh.

**Figure 5.1: Granton Corridor and Areas of Multiple Deprivation**



Key employment sites include the Western General Hospital, Leonardo and the Craighall Shopping Centre.

Crewe Road North, Crewe Road South and Orchard Brae provide the most direct route to the city centre although the strategic road network is primarily orientated in an east-west pattern along West Granton Road, Ferry Road, Telford Road and Queensferry Road.

The Telford Path acts as an informal linear park through the area.

#### 5.1.2 Existing public transport network

The existing public transport network on the corridor includes a high volume of bus movements along Crewe Road North/ Crewe Road South/ Queensferry Road connecting communities in North Edinburgh such as Granton Harbour, Granton, Muirhouse, Pennywell, Drylaw and Pilton with the Western General Hospital, Craighall Shopping Centre and the city centre.

#### 5.1.3 Existing active travel

North Edinburgh also has a well-developed and used active travel network. NCN1 (and the Telford Path) follow a former track bed and provides a good quality active travel link connecting Granton, Pilton, West Pilton, Craighall and Ravelston with the east of Edinburgh's city centre, via Roseburn.



**Figure 5.2: Roseburn Path Active Travel Corridor**



#### 5.1.4 Section breakdown

The corridor has been divided into two key sections:

- Section A - Caroline Park to Crewe Toll; and
- Section B – Crewe Toll to Roseburn.

Each section includes a number of options; these are detailed further in the following section and shown graphically in Figure 5.3.

### 5.2 Granton North (Section A) Options

#### 5.2.1 Introduction

Table 5.1 provides an overview of the key attributes of each option. Note that attributes – number of stops, location and journey times are indicative at this stage.

**Table 5.1: Section A Key Attributes**

	Option	Length Overall (m)	Length of New Infrastructure (m)	No. stops overall (Inclusive of Start and End)	No. New Stops	Approx Run Time from Start to End Stop (mins)	Average Speed (km/h)
A1	Crewe Toll to Caroline Park via West Granton Access Road	1,280	1,280	3	3	4	18.0
A2	Crewe Toll to Caroline Park via Crewe Road North	1,130	1,130	3	3	4	16.6
A3	Crewe Toll to Caroline Park via Pennywell Road	2,700	2,700	5	5	9	17.8



Figure 5.3: Section A- Granton

### A1

#### Safeguarded route alongside West Granton Road

- ✓ Direct route
- ✓ Provides for segregated tram and active travel
- ✗ Limited connectivity from east

### A2

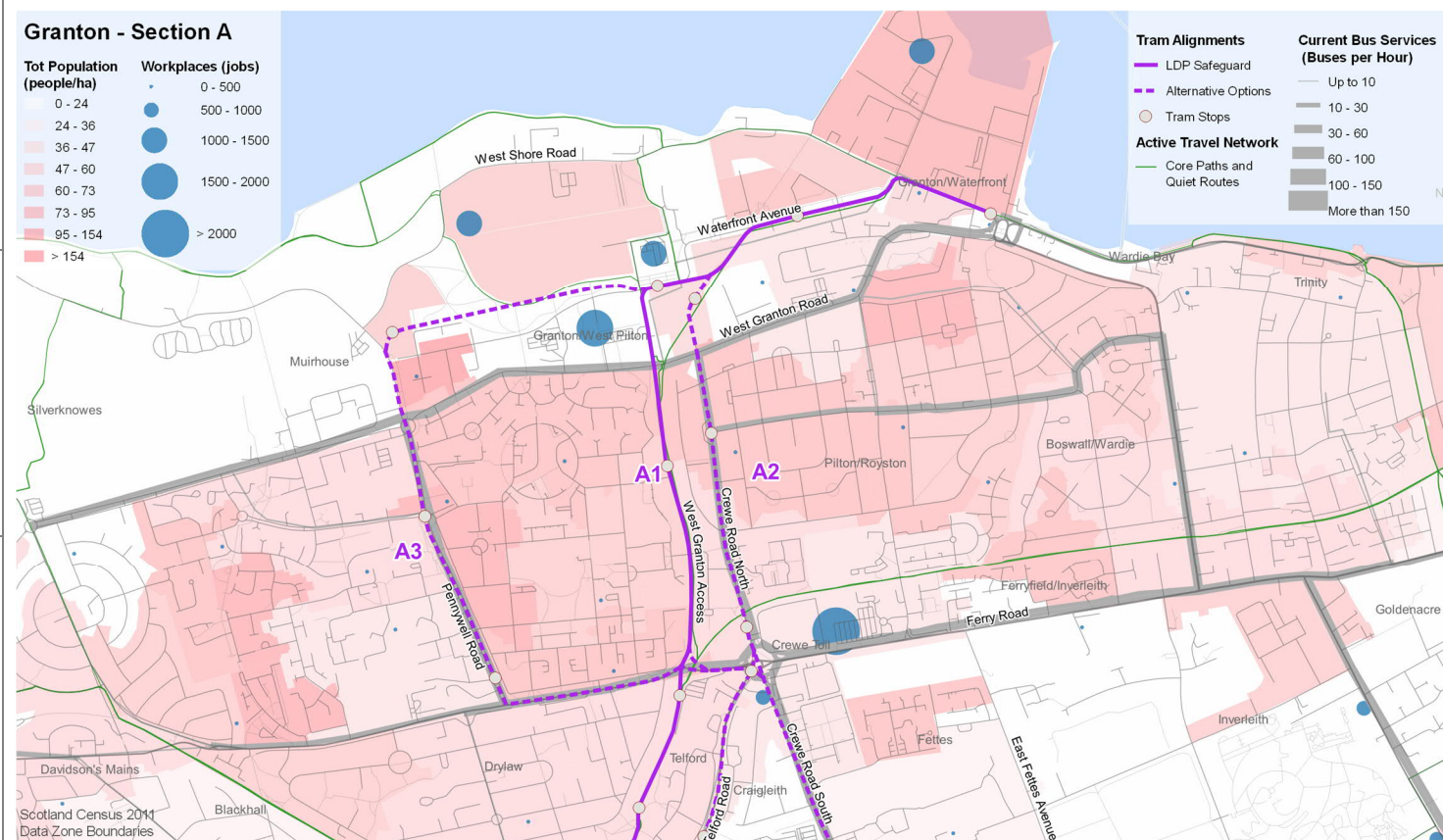
#### On-road using Crewe Road North with tram sharing roadspace

- ✓ Direct route
- ✓ Difficulty of crossing Crewe Toll – A2 to B2 in practice is difficult to deliver due to geometry constraints
- ✗ Limited connectivity from west

### A3

#### Segregated route in verge of Ferry Road and central reserve of Pennywell Road. Assumes good tram priority and residual buses mix with traffic

- ✓ larger catchment and serves Pennywell Road area (e.g. Urban Union)
- ✗ Longer route length compared to A1 and A2 – additional costs and longer end to end journey times



### 5.2.2 A1: Crewe Toll to Caroline Park via segregated West Granton Access Road

The alignment of Option A1 follows West Granton Access Road from Ferry Road to Caroline Park. This option is the existing safeguarded route and provides a direct and segregated tram and parallel high-quality active travel route.

The alignment ties into to southern section of the corridor (B) at either the Ferry Road/ West Granton Access junction or slightly east, at independent crossing of Ferry Road. Both options avoid Crewe Toll roundabout which is geometrically constrained; a relatively simple crossing at Ferry Road benefits tram operation as potential delays are reduced.

Enablers of this option include the ability to provide interchange with local bus and developing north Edinburgh cycle networks. It also supports high density development around Granton Harbour and integration with the east end of the Granton Waterfront masterplan.

An issue relates to catchment connectivity. Access from West Granton Access to the east is limited; however, a new link from Crewe Road Gardens overbridge may help overcome this issue. Nevertheless, there is a significant level difference and a DDA compliant solution will require significant land take.

### 5.2.3 A2: Crewe Toll to Caroline Park via Crewe Road North

Option A2 runs on-street between Crewe Toll and Caroline Park via Crewe Road North.

In terms of the rationale, the option provides an on-street alternative to Option A1 and better connectivity eastwards towards Pilton/ Boswell.

Enablers of this option are as above and include the ability to provide interchange with local bus and cycle networks. It also supports high density development around Granton harbour and waterfront.

In theory, this option provides a more logical link to Option B2 (discussed subsequently). However, in practice there are significant engineering challenges in crossing Crewe Toll to connect with any of the options in Section B. Initial microsimulation modelling has been unable to help identify an acceptable design, both in terms of tram operation and general traffic capacity. In addition, although A2 improves transit catchment access from the east, access from Muirhouse and the west is constrained instead.

In summary, the catchment size of A1 and A2 is similar but both serve different areas of north Edinburgh without additional intervention to improve access. A2 necessitates crossing Crewe Toll roundabout, which is extremely challenging, and also impacts on residential properties on Crewe Road North.

### 5.2.4 A3: Crewe Toll to Caroline Park via Pennywell Road

Option A3 turns west along Ferry Road, then follows Pennywell Road, Waterfront Park and Avenue towards Granton Square. The option assumes a segregated route along the verge of Ferry Road, and central reserve of Pennywell Road. Good transit priority and mixing with residual buses and traffic is assumed.

The route has the potential serve a wider catchment than Option A1 and A2, including central Muirhouse (and the Urban Union development); however, the longer route length compared with the other options would be more costly to construct and result in longer end to end journey times.

In practice, transit journey times from Granton are unlikely to be competitive with bus, undermining the business case for the alignment.

### 5.2.5 Pinchpoints

As above, there are significant engineering challenges in Option A2 crossing Crewe Toll to connect with any of the options in Section B. This greatly reduce the viability of this option from a feasibility and cost perspective.

### 5.2.6 Option Assessment

Table 5.2 summarises the Option Assessment for Section A.

Table 5.2: Section A Option Assessment

	A1 Integrated Corridor	A2 On-street via Granton Rd N	A3 On-street via Pennywell Rd	Comments
<b>Cost and Journey Time (Ranked 1 = Better/ Lower Cost/ Shorter)</b>				
Comparative capital cost	1	2	3	A1 least costly (land acquired and utilities cleared). A3 more expensive/ longer
Comparative journey time	1	2	3	A1 & A2 similar, but A1 would be segregated and therefore faster and more reliable. A3 longest as indirect.
<b>Transit Demand Potential (Scored +1 to +3)</b>				
Ability to serve existing demand/ catchment	2	2	2	A1 & A2 better serve catchments to Pilton/ Boswall respectively. A3 less direct but serves existing demand
Ability to serve new development	3	3	1	Circuitous routing of A3 means less attractive in serving Granton.
Ability to attract modal shift	2	2	1	A1 & A2 can attract more mode share of 'existing' (than A1) and support higher PT mode share from Granton (than A3).
<b>Assessment Against Objectives (Scored +3 to -3)</b>				
Sustainable economic growth/ development	3	3	1	A2 + A3 serve higher levels of existing residents and employment than A1. A3 served Granton less well.
Improved equality & social inclusion	3	3	2	A2 + A3 better serve areas of higher deprivation. A3 served Granton less well.
Reduced transport related carbon emissions	2	2	1	
Improved built & natural environment	0	-1	0	A1 on safeguarded alignment adjacent to West Granton Access Road. A2 would impact on existing residential road. A3 can be integrated into on-street environment
Improved health, wellbeing & safety	1	1	1	All options consistent with provision of active travel corridor
<b>Deliverability Assessment (Risk Based RAG Assessment – 1 = Low, 2 = Med, 3 = High/ Potential Showstopper)</b>				
Infrastructure deliverability	1	2	2	A1 land acquired and clear of utilities. Feasibility proven
Operational deliverability	1	2	1	A1 segregated. A3 can be designed to deliver priority/ segregation
Environmental impact	1	2	1	A1 built in linear park but designed to accommodate tram.
Powers and consents	1	2	2	TWAO required - risk related to Env impacts & stakeholder acceptability
Land and property impact	1	2	1	
Stakeholder acceptability	1	2	1	
Implementation disruption	1	2	2	
Impact on other modes	1	2	1	A2 likely to impact in active travel
Other dependence	1	1	2	No direct dependence, but need to integrate with Granton Masterplan
<b>Indicative Financial/ Economic Performance (Risk Based RAG Assessment – 1 = Low, 2 = Med, 3 = High/ Potential Showstopper)</b>				
Financial performance	1	1	2	A1 off street so fastest but A2 and A3 have better catchment.
Economic performance	2	2	3	A3 - Expected show-stopper due to high capital cost and slow journey time

### 5.2.7 Recommendations

The following table summarises the recommendations and rationale for Section A and its associated options.

**Table 5.3: Section A Recommendations**

	Option	Recommendation	Rationale
A1	Crewe Toll to Caroline Park via segregated route parallel to West Granton Access Road	Consider in greater detail	Safeguarded alignment Segregated route allows fast, reliable, direct connection Allows for segregated high-quality active travel provision Allows for integration with bus network. No significant traffic management issues identified
A2	Crewe Toll to Caroline Park via on-street alignment on Crewe Road N	Reject	Significant engineering works required to enable transit to pass from Section A to Section B
A3	Crewe Toll to Caroline Park via segregated alignment on Pennywell Road	Reject	Longer route resulting in additional costs and longer end to end journey times would. Significant utilities would need to be accommodated on Pennywell Road

## 5.3 Granton South (Section B) Options

### 5.3.1 Introduction

Three options have been considered for Section B of the Granton corridor, an overview of each is given in Table 5.4.

**Table 5.4: Section B Key Attributes**

	Option	Length Overall (m)	Length of New Infrastructure (m)	No. stops overall (Inclusive of Start and End)	No. New Stops	Approx Run Time from Start to End Stop (mins)	Average Speed (km/h)
B1a	Shandwick Place to Crewe Toll via NCN1 and Telford Path (do minimum)	4,650	3,130	7	4	12	24
B1b	Shandwick Place to Crewe Toll via NCN1 and Telford Path (Do maximum)	4,650	3,130	7	4	12	24
B2	Shandwick Place to Crewe Toll via Orchard Brae	3,020	3,020	7	4	11	16

These options are described further below and are shown geographically in Figure 5.4.

### 5.3.2 B1a: Roseburn to Crewe Toll

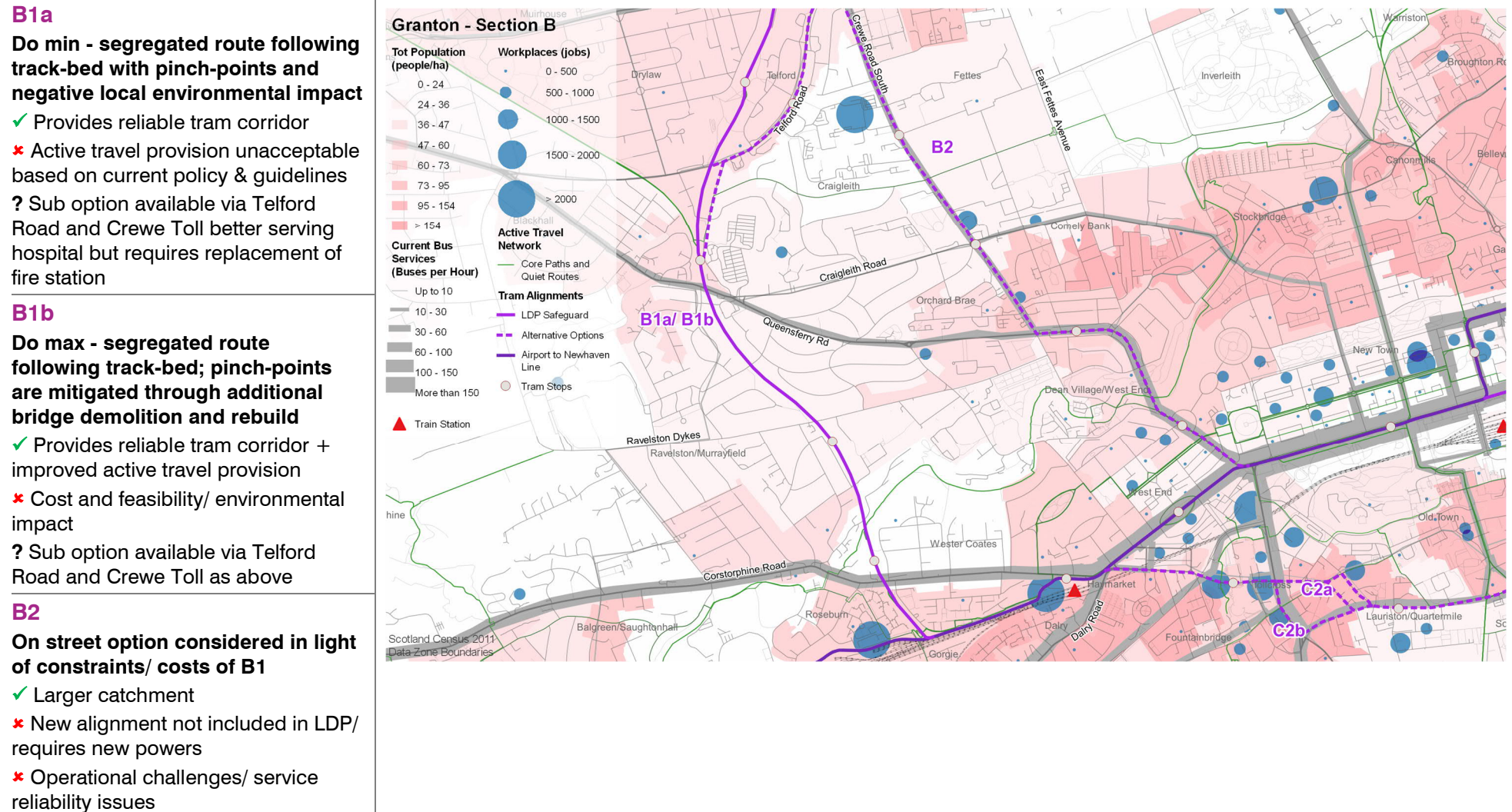
The route of Option B1a follows the Roseburn Path from the A8 to Ferry Road, west of Crewe Toll. The alignment is fully segregated, following an old railway track bed, and now an active travel corridor and part of NCN1. The alignment is the safeguarded route for transit with existing construction powers in place.

B1a is a do minimum solution following the track bed. This original tram proposal for this corridor included an adjacent 3.0m combined cycle path/ footpath. 'Edge conditions', such as a retaining wall or fence immediately alongside, reduce the available width. In addition, existing bridges were not proposed to be widened, creating additional 'pinch-points' (generally 2m wide and less in some cases).

The general approach taken with the original alignment was to raise or lower the track bed to increase available width, and to employ slope regrading and retaining walls where required. The environment of the linear park would be significantly impacted by this engineering work.



Figure 5.4: Section B, Roseburn



Option B1a would result in similar design compromises with active travel path widths of less than 2m at several locations. Should this option be taken forward, additional off-line active travel provision could be made on Queensferry Road and Dean Bridge towards the city centre.

The design would have significant negative impacts on the built environment due to transit requirements.

As the route is segregated, no traffic management, bus network or planning issues are identified.

Potential tram capacity issues require consideration between towards Haymarket and through the city centre. This needs to be considered in the context of potential routes to the South East, additional city centre infrastructure and the service pattern options this would afford.

### Alternative Option

An alternative option would utilise Telford Road to provide more direct connectivity to the Western General Hospital; however, an initial alignment assessment has identified routing constraints in the vicinity of Crewe Toll. These relate to the location of existing adjacent buildings, such as the fire station, and will require careful consideration during future option development and refinement.

#### 5.3.3 B1b: Roseburn to Crewe Toll

The route of Option B1b is as B1a but this scenario has enhanced active travel provision, in accordance with current design guidance. A target foot/cycle path width would be 4.5-5.0m, with 3.5m at pinch-points. To achieve the design requirements, the majority of existing structures would be demolished and replaced, as summarised in Table 5.5.

**Table 5.5: Section B Infrastructure Characteristics**

Structure	Option B1a	Option B1b
Roseburn Terrace Tram overbridge	Deck replacement and widening. Abutment extension.	As original but increased widening
Coltbridge Viaduct	Bolt-on cycle track bridge	No change
St Georges access bridge Highway overbridge	No substantial works	Demolish and rebuild to provide 5m cycle track and twin tram track
St Georges footbridge Highway overbridge	No substantial works	No change
Ravelston Dykes Road overbridge	No substantial work – 2.7m cycle track	Demolish and rebuild to provide 5m cycle track and twin tram track.
Craighleith Drive Tram overbridge	New widened deck sitting on top of existing structure. 3m cycle track	No change (acceptable pinch point width)
Holiday Inn access. Highway overbridge	No substantial works – 2.25m cycle track	Demolish and rebuild to provide 5m cycle track and twin tram track
Queensferry Road bridge. Highway overbridge	No substantial works – 2.3m cycle track	Demolish and rebuild to provide 5m cycle track and twin tram track
Greenhill Road South Bridge. Tram overbridge	New widened deck sitting on top of existing structure. 3m cycle track	No change (acceptable pinch point width)
Telford Road bridge. Highway overbridge	No substantial work – 2m cycle track	Demolish and rebuild to provide 5m cycle track and twin tram track
Crewe Road gardens bridge Highway overbridge	No substantial work (cycle track on opposite side of West Granton Access)	No change

A more contemporary design-led engineering approach is also assumed, reducing the negative impact on the built environment.

As above, this alignment is the safeguarded route for transit.

Key issues with Option B1b are cost, feasibility and the environmental impact of do max construction works. Potential capacity issues at Haymarket also require consideration.

## Alternative Option

As above, an alternative option would utilise Telford Road to provide more direct connectivity to the Western General Hospital. An initial alignment assessment has identified routing constraints, such as the fire station, and these will require further consideration during future option development.

### 5.3.4 B2: Shandwick Place to Crewe Toll

Option B2 runs between Shandwick Place at the west end of Princes Street and Crewe Toll and assumes an on-street route following Queensferry Road, Orchard Brae and Crewe Road South.

This option has been introduced to test against option B1b in light of the additional costs of the do-max option. B2 has other advantages including a stronger catchment; it better serves key trip generators, including Comely Bank and the Western General Hospital, due to the on-street alignment.

B2 allows the retention of the Roseburn Path/ NCN1 as a dedicated active travel corridor. Potential environmental impacts along the Roseburn Path are also avoided.

Cross-section constraints require that the Roseburn Path would be the recommended parallel cycling route. Nevertheless, safe on-street cycling provision would be made wherever possible.

Traffic management would prioritise transit through junctions similar to the existing on-street city centre section; however, service reliability is likely to be lower than with an off-street alignment. Overhead wires on Dean Bridge would require careful design and mitigation in order to minimise the impact on protected city views. New powers would also be required.

Again, this alignment is constrained in the vicinity of Crewe Toll fire station. Further work to refine design options is required should this route be taken forward.

### 5.3.5 Pinchpoints

Dean Bridge presents a pinch point on Option B2 where cyclists would be unsegregated from traffic and trams (tracks).

### 5.3.6 Option Assessment

The Section B Option Assessment is given in Table 5.6 below.

Table 5.6: Section B Option Assessment

	B1a Roseburn Do- min	B1b Roseburn Do- max	B2 On-street via Orchard Brae	Comments
<b>Cost and Journey Time (Ranked 1 = Better/ Lower Cost/ Shorter)</b>				
Comparative capital cost	1	2	2	End to end journey time similar. B1a & b are longer but faster due to segregation
Comparative journey time	1	1	1	
<b>Transit Demand Potential (Scored +1 to +3)</b>				
Ability to serve existing demand/ catchment	1	1	2	Limited new development on section - but B2 has potential to serve more
Ability to serve new development	0	0	1	Similar overall, but B1a/ b vs B2 serve different markets - net effect uncertain
Ability to attract modal shift	2	2	2	
<b>Assessment Against Objectives (Scored +3 to -3)</b>				
Sustainable economic growth/ development	2	2	2	B2 may be slightly better through serving larger local catchment.
Improved equality & social inclusion	1	1	2	
Reduced transport related carbon emissions	2	2	2	B2 specific issues at Dean Bridge (esp if overhead wires) and potential impact on key views. B1b provides more space for active travel, but greater environmental impact
Improved built & natural environment	-2	-2	-2	B1a constrains existing high quality active travel corridor, and limits ability to improve future provision
Improved health, wellbeing & safety	-2	0	0	
<b>Deliverability Assessment (Risk Based RAG Assessment – 1 = Low, 2 = Med, 3 = High/ Potential Showstopper)</b>				
Infrastructure deliverability	1	2	2	B2 likely to require mixed running. B1a, B1b, potential capacity issue at Haymarket
Operational deliverability	1	1	2	
Environmental impact	2	2	2	Assume B1a has existing consent. B2 does not
Powers and consents	1	2	2	Assume B2 requires land at pinch points
Land and property impact	1	2	2	B1a - ranked 3 due to active travel/environmental groups
Stakeholder acceptability	3	2	2	
Implementation disruption	2	1	2	Impact of active travel from B1a and impact on all modes on B2
Impact on other modes	3	1	2	No direct dependence
Other dependence	1	1	1	
<b>Indicative Financial/ Economic Performance (Risk Based RAG Assessment – 1 = Low, 2 = Med, 3 = High/ Potential Showstopper)</b>				
Financial performance	2	2	2	Cost of option B1b may be prohibitive - showstopper in VfM terms. Telford Road sub-option allows wider catchment including hospital
Economic performance	2	2	2	Both B1b and B2 would be high cost options

### 5.3.7 Recommendations

Table 5.7 summarises the recommendations and rationale for Section B and its associated options.

**Table 5.7: Section B Recommendations**

	Option	Recommendation	Rationale
B1a	Shandwick Place to Crewe Toll via NCN1 and Telford Path (do minimum)	Reject	Option does not allow for acceptable active travel provision based on current policy and guidelines.
B1b	Shandwick Place to Crewe Toll via NCN1 and Telford Path (Do maximum)	Consider in greater detail.	Provides direct segregated tram corridor allowing fast journey times. Provides potential for acceptable active travel provision. Provides opportunity for sub-option allowing improved connectivity to Western General.
B2	Shandwick Place to Crewe Toll via Orchard Brae	Consider in greater detail.	Provides larger catchment along corridor including residential and key trip generators such as Western General. Provides similar end to end journey time to Option B1b Provides opportunity for existing NCN1/Telford Path active travel route and associated linear park to be retained.





### **6.1.2 Existing public transport network**

The A7 is a major bus corridor with over 50 movements per hour per direction on the route between Cameron Toll and East Preston Street, increasing to nearly 80 between East Preston Street and the city centre (pre-Covid).

The south of the corridor presents opportunity for integration with transit at Shawfair and Newcraighall stations, both of which are served by the Borders Rail line and thus present opportunities for improved regional connectivity. Current Park & Ride sites are located at Sheriffhall and Shawfair. In the future, development of mobility hubs at these and other sites present opportunity for Integration of transit with rail, local bus and other shared modes. This would assist in improving the catchment of the transit corridor.

### **6.1.3 Existing active travel**

Existing active travel provision on the corridor is fragmented and includes sections of on-street cycle lane and shared bus/taxi/cycle lanes. The area between Nicholson Square and East Preston Street has a high street feel, with high pedestrian footfall.

The corridor has been broken down into two key sections and a number of options within these two sections as detailed further in this section.

### **6.1.4 Section breakdown**

The corridor has been broken down into two key sections:

- Section D – Nicolson Square to BioQuarter; and
- Section E – BioQuarter to Newcraighall or Sheriffhall/Shawfair.

## **6.2 South East Corridor (Section D) Options**

### **6.2.1 Introduction**

ESSTS Phase 1 assessed a number of route options between Nicolson Square and BioQuarter; however, due to topographical constraints, only one viable transit/ tram alignment was identified.

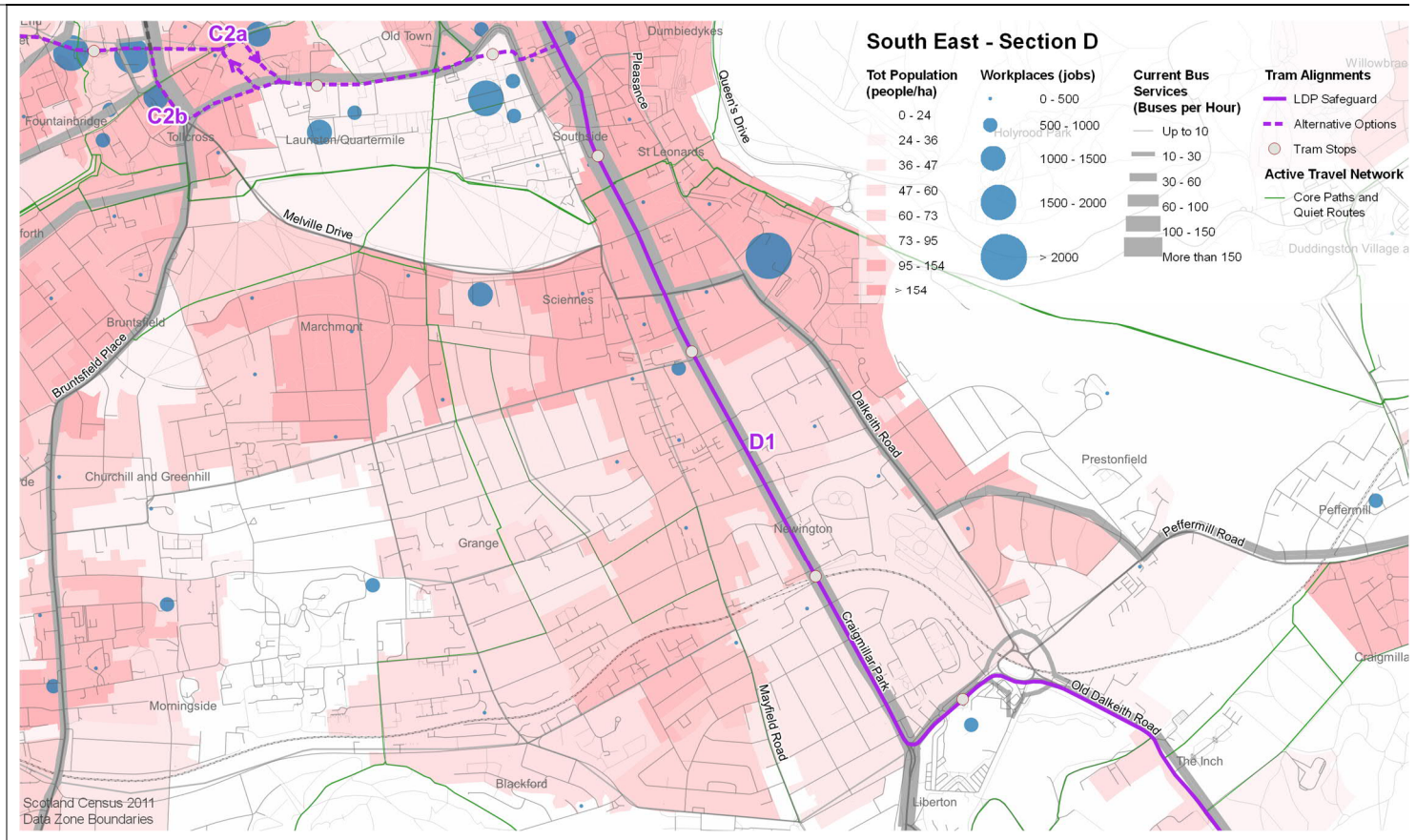
The proposed route, Section D1, is shown in Figure 6.2.

Figure 6.2: Section D: Southside/ Newington

## D1

**Safeguarded on-carriageway route from Nicholson Square to Bio Quarter. Public transport priority corridor serving bus and tram**

- ✓ Transit offers transformational opportunity to improve quality of place and act as an enabler
- ✓ Potential for enhanced walking environment
- ✗ Acceptability of degree of traffic management required to ensure adequate tram journey times and reliability
- ✗ Need to consider acceptability of displacing through north/ south cycling to alternative corridor





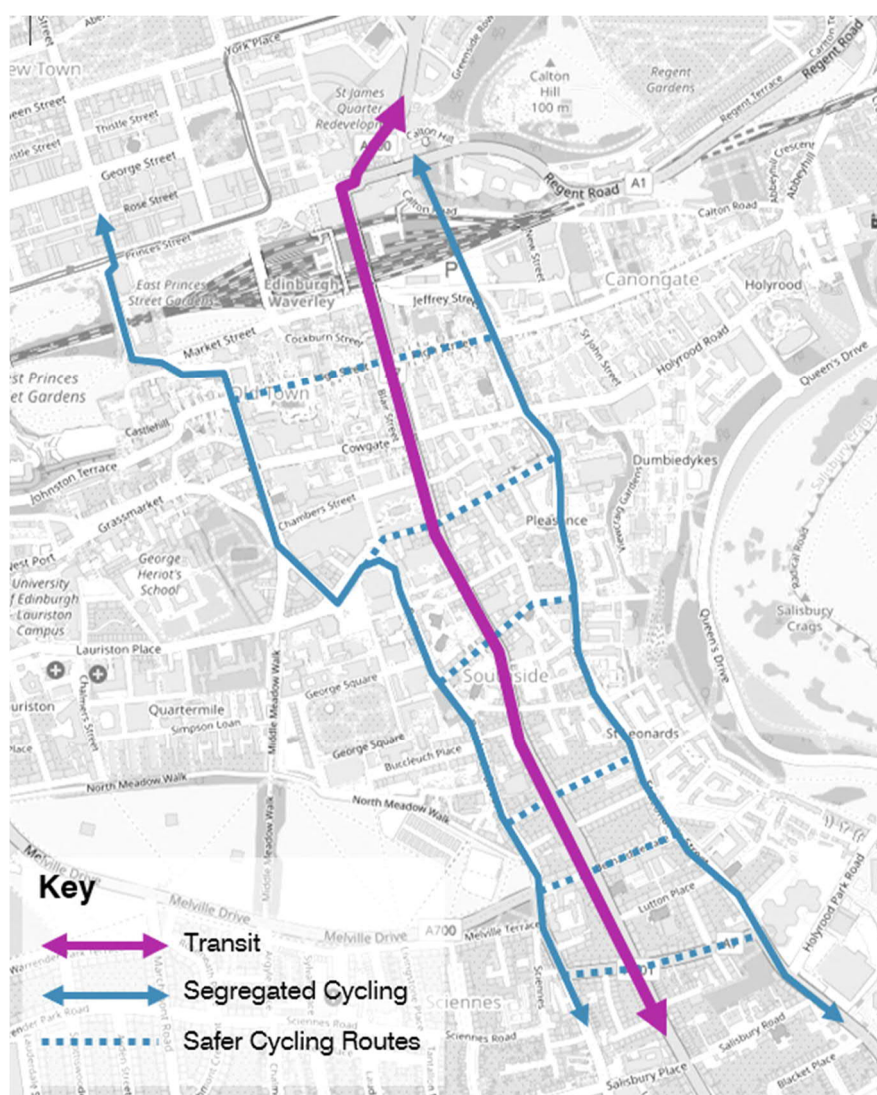
## 6.2.2 Section D1: Nicolson Square to BioQuarter

Section D is an on-street alignment between Nicholson Square and the BioQuarter. It is the protected alignment within the Local Development Plan and the only suitable north/ south route for tram as topography prohibit alternative alignments. It is also an important arterial route to and from the city centre and an established corridor of high public transport demand.

The northern section, between Nicholson Square and Salisbury Road provides a local high street function, with significant pedestrian volumes. The cross-section of this part of the route is constrained and it is assumed that through traffic would be reduced with access limited local movements, prioritising transit and public transport.

Segregated cycling would need to be provided on parallel corridors, with quality connections into the A7 corridor (Figure 6.3). Cycling would still be permitted on Nicholson Street and designs would seek to ensure a safe environment. Nevertheless, longer distance movements would be encouraged to use alternative routes.

**Figure 6.3: Potential Cycle Provision**



Transit provides an opportunity for a transformational change in the public realm, creating a sense of place. It would enable wider footways and the creation of new attractive spaces, supporting local retail and leisure uses.

Servicing and loading arrangements will require careful design in order to support local businesses and residents, while accommodating bus and transit stops and the place making objectives above.

It is assumed that transit integration with the bus network will support a reduction in services over the inner section of the corridor. The bus network would evolve to feed transit, supported by multi-modal hubs and Park & Ride at strategic locations such as Sheriffhall, Shawfair or Newcraighall.

Key issues with this route section include:

- the degree of traffic management required to deliver reliable tram journey times, and
- the acceptability of displacing north/ south cycling to alternative parallel corridors

## 6.2.3 Pinchpoints

South of Nicholson Square, the cross-section of Nicholson Street starts to widen, making it easier to accommodate transit and other kerbside uses.

South of Salisbury Road, Minto Street widens significantly and transit can be readily accommodated as far as Cameron Toll.

**Figure 6.4: Reserved Cameron Toll Tram Alignment**

- The reserved tram alignment runs in front of the shopping centre, as agreed with the centre owners. While this is a more direct alignment, there is limited space between Lady Road and the north east entrance. Level differences will require significant retaining wall structures to resolve.
- The revised alignment crosses the Craigmillar Park/ Lady Road junction, requiring a major reconfiguration of this busy junction.
- The Cameron Toll to BioQuarter active travel scheme is currently in development. This runs parallel to the A7, following the route of the proposed tram alignment. While the scheme does not prohibit future transit, significant elements would require to be reconstructed on an amended alignment.



## 6.2.4 Option Assessment

As above, topography means that there are alternative options to Section D and so no option assessment has been carried out for this route.

### 6.2.5 Recommendations

The following table summarises the recommendations and rationale for Section D1 and its associated options.

### Table 6.1: Section D Recommendations

	Option	Recommendation	Rationale
D1	Nicolson Square to BioQuarter via on-street alignment	Consider in greater detail	Only feasible route connecting City Centre to south east Edinburgh due to topography

### 6.3 South East Corridor (Section E) Options

### 6.3.1 Introduction

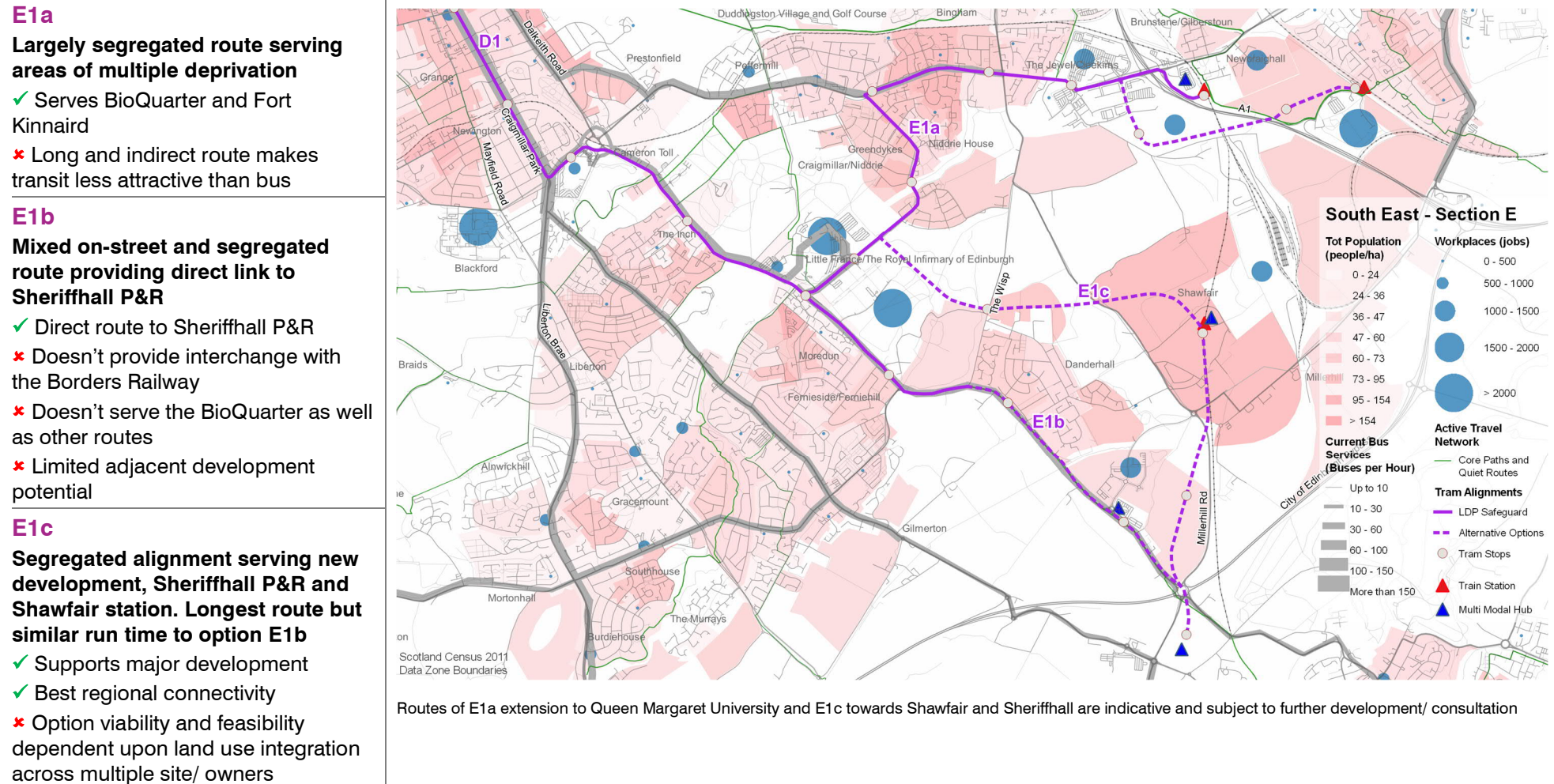
Three options have been considered for Section E of the South East corridor:

- E1a: BioQuarter to Newcraighall
- E1b: BioQuarter to Sheriffhall
- E1c: BioQuarter to Sheriffhall via Shawfair

These options are described further below and summarised in Figure 6.5.



Figure 6.5: Section E, BioQuarter and South East



Key attributes of each alignment option are summarised in Table 6.2.

**Table 6.2: Section E Key Attributes**

	Option	Length Overall (m)	Length of New Infrastructure (m)	No. stops overall (Inclusive of Start and End)	No. New Stops	Approx Run Time from Start to End Stop (mins)	Average Speed (km/h)
E1a	BioQuarter to Newcraighall via largely segregated route	4,560	4,560	7	7	13	20.7
E1b	BioQuarter to Sheriffhall via mixed on-street and segregated alignment	3,100	3,100	4	4	7	25.4
E1c	BioQuarter to Sheriffhall via Shawfair on segregated alignment	4,900	4,900	6	6	9	31.5

### 6.3.2 E1a: BioQuarter to Newcraighall

Option E1a runs between BioQuarter and Newcraighall on a largely segregated route serving Niddrie and Craigmillar, both areas of relative deprivation, and Fort Kinnaird Retail Park.

Significant sections of the corridor are segregated, although local traffic is required to cross the alignment. Elsewhere, traffic signals would be coordinated to prioritise transit.

The rationale for this option is that it is safeguarded in the local development plan, serves a number of strategic development sites and supports social inclusion and local economic regeneration. The alignment is also close to the entrance to Royal Infirmary and BioQuarter, providing improved access to health care and employment.

Conversely, while the route links multiple areas of high density and demand, the circuitous alignment results in an extended transit journey time. East of the BioQuarter, this is unlikely to be competitive with bus, undermining the potential business case for the scheme.

There is an opportunity to extend Option E1a beyond Newcraighall Station to serve Queen Margaret University and connect with Musselburgh Rail Station.

### 6.3.3 E1b: BioQuarter to Sheriffhall

Option E1b provides a direct link between the BioQuarter and Sheriffhall Park and Ride, on a mixed on-street and segregated alignment. It is assumed that adjacent active travel facilities would be provided.

The Edinburgh section of the alignment is safeguarded for transit within the LDP. A key benefit is that it serves Sheriffhall Park & Ride and provides a direct link towards Midlothian.

Key issues with Option E1b include:

- the lack of connectivity to the national rail network
- the environmental impact and associated acceptability in delivering segregated sections of the route
- the longer walking distance to the Royal Infirmary and BioQuarter compared with Option E1a and E1c.

There is an opportunity to extend Option E1b to Dalkeith, either through a future extension of transit or supporting feeder bus/ BRT services.

### 6.3.4 E1c: BioQuarter to Sheriffhall via Shawfair

Option E1c provides a link between the BioQuarter and Sheriffhall Park & Ride, via Shawfair, on a segregated alignment serving new development. Though the longest of the Section E options, segregation enables a run time similar to option E1b.

As with Option E1b, adjacent active travel facilities would be provided.

A key driver for this alignment is the ability to provide interchange with the Borders Railway, providing connectivity between Midlothian and the Borders and south Edinburgh. It also enable strategic development around Shawfair and directly serves the Royal Infirmary and BioQuarter.

A key issues with E1c is that it is dependent on future development and land-use integration across multiple sites/ owners. Pro-active planning and engagement is required to safeguard the transit corridor at an early stage.

As with E1b, the opportunity exists to extend E1c to Dalkeith, either through a future extension of transit or supporting feeder bus/ BRT services.

### 6.3.5 Pinchpoints

No significant pinchpoints have been identified within Section E.

- Routes E1a and E1b are protected within Edinburgh's existing Local Development Plan
- No specific provision has been made from tram within the Midlothian Plan. E1b is considered deliverable although it will require replacement of the Shawfair to Roslin cycle path bridge across the A7
- Initial discussions with Midlothian suggest that route E1c is also deliverable. Interchange with Shawfair station is an important element of this option and so requires reconfiguration of the Shawfair masterplan. Nevertheless, transit could significantly assist in the early delivery of the town centre elements of the scheme. The northern half of Shawfair is relatively constraint free; to the south, construction has already commenced and detailed route options will need to be developed in conjunction with the council and key stakeholders.

### 6.3.6 Option Assessment

The Section E Option Assessment Framework is given in Table 6.3.

Table 6.3: Section E Option Assessment

	E1a Newcraighall (Station/ P&R)	E1b To Sheriffhall P&R	E1c Sheriffhall via Shawfair	Comments
<b>Cost and Journey Time (Ranked 1 = Better/ Lower Cost/ Shorter)</b>				
Comparative capital cost	2	2	2	E1b requires significant retaining structures/ utilities. E1a and E1c longer but simpler
Comparative journey time	2	1	1	E1c fastest and most reliable journey time. E1b similar to E1a, but less segregation means less journey time reliability. E1a is significantly longer and therefore slowest.
<b>Transit Demand Potential (Scored +1 to +3)</b>				
Ability to serve existing demand/ catchment	3	2	1	E1a serves largest existing catchment, then E1b. E1c focused on future development
Ability to serve new development	2	2	3	E1c has greatest potential to serve and enable new development.
Ability to attract modal shift	1	2	3	E1a & c - opportunity for interchange with rail but Shawfair more attractive. E1b & c serve Sheriffhall which is likely to have a larger car catchment
<b>Assessment Against Objectives (Scored +3 to -3)</b>				
Sustainable economic growth/ development	2	2	3	E1c has greatest potential to support new development
Improved equality & social inclusion	3	1	2	E1a - serves derived areas around Newcraighall
Reduced transport related carbon emissions	1	2	3	E1c - opportunity for P&R and transfer from rail. E1a less suitable rail interchange
Improved built & natural environment	1	-1	0	E1b requires significant retaining structures but corridor would benefit from investment
Improved health, wellbeing & safety	0	0	0	
<b>Deliverability Assessment (Risk Based RAG Assessment – 1 = Low, 2 = Med, 3 = High/ Potential Showstopper)</b>				
Infrastructure deliverability	1	2	2	E1b requires significant structures. E1c dependant on third party development
Operational deliverability	1	2	1	Sections of E1b will be in mixed traffic on the A7 - likely to be challenging as little opportunity for segregation and congested. E1a and c would be largely segregated.
Environmental impact	1	2	2	E1a is protected. E1b and E1c potential impacts less certain at this stage.
Powers and consents	1	2	2	
Land and property impact	1	2	2	
Stakeholder acceptability	2	2	2	
Implementation disruption	2	2	1	
Impact on other modes	1	1	1	
Other dependence	1	1	2	Dependent on development in SE but route also enables that development.
<b>Indicative Financial/ Economic Performance (Risk Based RAG Assessment – 1 = Low, 2 = Med, 3 = High/ Potential Showstopper)</b>				
Financial performance	2	2	2	E1a has slowest JT, and less competitive with other modes > likely higher opex and lower demand. E1c has strongest potential, but dependent on scale of development.
Economic performance	2	2	2	As above



### 6.3.7 Recommendations

The following table summarises the recommendations and rationale for Section E and its associated options.

**Table 6.4: Section E Recommendations**

	Option	Recommendation	Rationale
E1a	BioQuarter to Newcraighall via largely segregated route	Consider in greater detail.	Safeguarded route. Provides direct link to Edinburgh Royal Infirmary, BioQuarter and Fort Kinnaird. Opportunity to link to integrate with other transport modes (Borders Railway, local bus, active travel) to provide enhanced local and regional connectivity. Opportunity to extend route to key trip generator at Queen Margaret University and Musselburgh.
E1b	BioQuarter to Sheriffhall via mixed on-street and segregated alignment	Consider in greater detail.	Safeguarded route. Opportunity to link to integrate with other transport modes (Park & Ride, local bus, active travel) to provide enhanced local and regional connectivity. Opportunity to improve access from Dalkeith/ Midlothian.
E1c	BioQuarter to Sheriffhall via Shawfair on segregated alignment	Consider in greater detail.	Provides direct link to Edinburgh Royal Infirmary and BioQuarter. Supports major development around Shawfair. Opportunity to link to integrate with other transport modes (Borders Railway, Park & Ride, local bus, active travel) providing enhanced local and regional connectivity. Comparable journey time to Option E1b despite longer route.

## **7. City Centre Infrastructure Options**

### **7.1 City Centre Overview**

The existing Airport to York Place tram route runs through the city centre from Haymarket, through West Maitland Street, Princes Street, South and North St Andrew Street to the York Place terminus. Completion to Newhaven will extend tram via Picardy Place, London Road junction, Leith Walk, Constitution St and Ocean Terminal.

City centre infrastructure options have considered how a south east corridor alignment could best link into the existing network, taking into account geometric, utility and structures constraints.

### **7.2 City Centre (Section C) Options**

#### **7.2.1 Introduction**

Three sections, C1, C2 and C3, have been assessed; the location of each is indicated in Figure 7.1 below.

#### **7.2.2 Section C1 Princes St/ Bridges/ Nicholson Square**

Option C1 is the original Tram Line 3 alignment, protected within the city's Local Development Plan. The route would leave the existing route at Princes Street/ South St David Street and continue east along Princes St to North Bridge. It would then follow North and South Bridge connecting into Section D above at Nicholson Square.

Crossing North and South Bridge poses potential challenges around utilities and structures.

An initial assessment of utilities conflicts has been undertaken, including conversations with Scottish Water and SGN (Gas). A separate technical note has been prepared summarising known utilities information. Work to-date suggests that there are no major issues and that tram is deliverable over this section. Nevertheless, a shared concern is that relocated utilities aren't bundled too tightly together making ongoing maintenance difficult.

Discussions have also been held with CEC's structures team, both North and South Bridge are considered capable of accommodating future tram. The North Bridge deck refurbishment project has considered tram in terms of loading although no specific provision has been made. Proposals for the construction of the tram track slab across South Bridge will require careful consideration. As a masonry arch, there is more room for construction depth, but this remains limited.

A short summary of identified structures issues is included within the separate Utilities technical note.

Similar to Section D, segregated cycling provision would be difficult to deliver due to limited corridor width. Any proposed design would seek to provide safe local cycle access but segregated provision would be proposed:

- to the west via The Mound, George IV Bridge and Buccleuch Street, and
- to the east across the Waverley Valley (potentially delivered as part of the Waverley Station Masterplan) and the Pleasance

#### **7.2.3 Section C2 Morrison Street/ Lauriston Place/ Potterrow**

Option C2 was developed in part to provide additional capacity across the city centre and in part as an alternative should structures or utilities constraints on North and South Bridge prove impossible to resolve.

The route extends from Haymarket along Morrison Street, Bread Street, Lauriston Street, Lauriston Place and Potterrow to Nicholson Square. It follows what is loosely termed the Innovation Mile. It picks up major sites of demand including The Exchange District, the proposed Exchange 2 and University of Edinburgh Lauriston and Central Campuses and the Edinburgh Futures Institute in between.

Further design development has highlighted a number of pinch points which make this scheme difficult to deliver in the short to medium term. These are West Port/ Lauriston Street, Bristo Square/ Potterrow/ Marshall Street and at Nicholson Square. Nevertheless, the route serves a key and expanding corridor of the city centre and so the route remains an important longer term opportunity.

Figure 7.1: Section C, City Centre

### C1

**Safeguarded alignment, connects the SE corridor to the existing route via North Bridge/ South Bridge**

- ✓ Interchange opportunity with Edinburgh Waverley (Masterplan)
- ✓ Transformational opportunity to improve quality of place
- ✗ Potential structures and utilities issues on North and South Bridge

### C2

**Second cross-city route. Alternative to C1 or complementary long term scheme**

- ✓ Delivers additional city centre connectivity and service flexibility
- ✓ Connects university central campus
- ✗ Alignment constraints

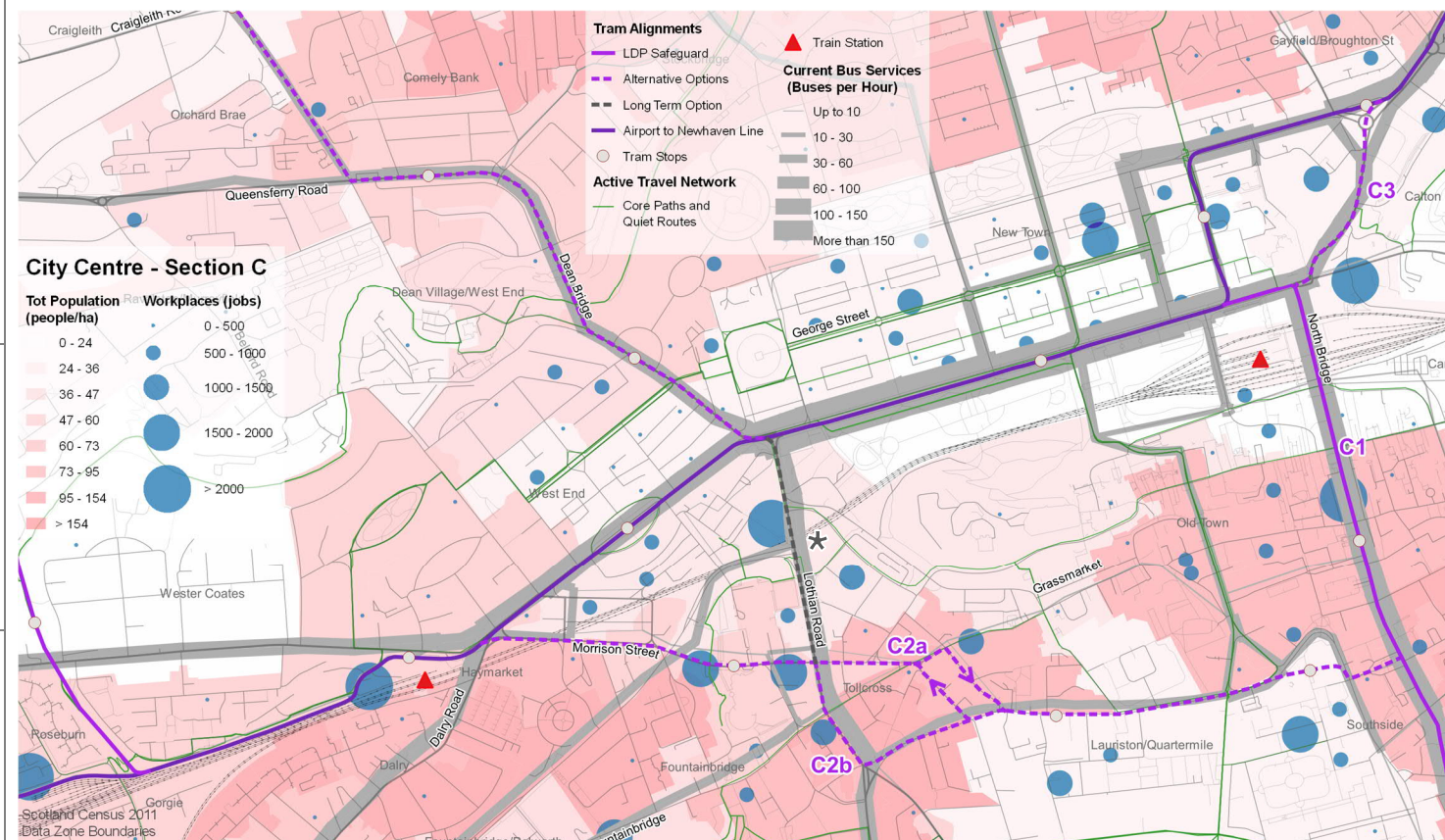
### C3

**Additional on street section from North Bridge to Picardy Place**

- ✓ Reduces tram volume at Princes St/ South St. Andrew Street junction
- ✓ Provides operational flexibility
- ✗ Impossible to directly serve existing Picardy Place tram stop

#### \* Lothian Road

? Long term opportunity should route B2 be delivered. Requires step change reduction in city centre traffic if delivered after C1



#### 7.2.4 Section C3 Leith Street

The current Tram Line 3 proposal connects into the existing network at the junction of Princes Street and South St David Street. The implemented track layout is optimised for movements between the west and north. Tying in a track alignment from the east is potentially difficult and will require further design development.

With a proposed frequency of 16 trams per hour to both Newhaven and the South East, 32 trams per hour would pass through the junction. Such a high frequency would be operationally challenging with only a short delay to a single tram causing wider network congestion.

Option C3 is a short section of tram route connecting the Newhaven and South East corridors via Leith Street. This enables north south services to avoid Princes Street, providing greater service reliability and flexibility. As elsewhere in the city centre, delivery of this section would require a significant reduction in traffic and further reconfiguration of the Picardy Place junction.

Trams on this Section C3 would be unable to serve the existing Picardy Place stop, instead an additional stop would be provided, in close proximity, on Leith St.

#### 7.2.5 Lothian Road

Should alignment B2 and C2 be delivered, then there is an opportunity to provide additional tram connectivity via Lothian Road. This scenario has not been considered in detail as part of this assessment.

Route C1 via North and South Bridge is recommended as the preferred first north/ south transit route. This provides links connectivity from both the airport and Newhaven/ Leith towards the south east of the city. The Newhaven to Royal Infirmary/ BioQuarter corridor alone generates high passenger demand. By comparison, demand from Granton to the south east is significantly lower, hence a route via Lothian Road is considered to be a long term proposal.

The delivery of tram routes on both the Bridges and Lothian Road corridors would require a step-change reduction in city centre traffic volumes.

#### 7.2.6 Pinchpoints

Four pinchpoint areas have been identified in the city centre.

##### Tollcross (Section C2)

- The relatively narrow width of Bread Street imposes a constraint on the turn into Lothian Road, placing the southbound tram in the centre of Lothian Road. Whilst it is envisaged that Lothian Road would be comprehensively remodelled to accommodate tram, alignment constraints impose a constraint on the junction geometry.
- The turn from Lothian Road into Lauriston Place, at a minimum radius, restricts the geometry of any junction reconfiguration.
- Constraints dictate that tram tracks would need to be centrally positioned within the Lothian Road corridor. As a result, there is insufficient road space to provide a tram stop in the vicinity of Tollcross.

##### Lauriston Place and Lady Lawson Street (Section C2)

- The narrow width of Lauriston Street and Lady Lawson Street dictates a single-track alignment. The turn from Lauriston Place into Bread Street requires land take outside of the highway boundary in order to overcome the 'twist' through this junction, arising from the differing highway gradients.
- Gradient issues are also evident at the West Port/ Lady Lawson Street & Lauriston Place/ Lauriston Street junctions. Again, a 'twist' is required as the tram tracks turn through each corner and negotiate changing gradients. Surrounding property is a constraint and considerable feasibility risk remains at these two locations.

##### Lauriston Place to Nicolson Square via Potterrow and Marshall Street (Section C2)

- The alignment assumes that the redevelopment of the University will enable tram between Lauriston Place and Marshall Street, via a re-configured Potterrow. The turn-radii are approaching the minimum for tram; this could create tram squeal noise annoyance issues.



- The layout of Nicolson Square constrains the turns for tram onto South Bridge/ Nicolson Street. It dictates the need to take land from the central grassed area and to relocate the public lavatories.

#### North Bride and Princes Street (Section C1)

- The westbound turn from North Bridge into Princes Street is constrained by the need to provide adequate pedestrian space. This dictates an alignment in the centre of both North Bridge and Princes Street.
- The turn from Princes Street into South St. Andrew Street is constrained by adjacent buildings and the need to tie-in to existing tram tracks. Note that the need for this turn is dependent on the proposed service pattern and could be omitted with the delivery of Section C3.
- Previous alignment designs for Princes Street outside the Balmoral Hotel showed a stop, twin tram tracks and a two-way bus link. It is considered that this infrastructure is undeliverable given high pedestrian and bus volumes.

#### Leith Street (Section C3)

- The turn between North Bridge and Leith Street is constrained. It is unlikely that any junction redesign would be able to accommodate a future tram stop. Potential provision on Leith Street is also challenging.

#### 7.2.7 Option Assessment

Sections C1, C2 and C3 each serve a different purpose and are therefore not directly comparable.

As above, initial Utilities and Structures analysis indicates that Section C1, via the east end of Princes Street and the Bridge Corridor, is deliverable.

A number of pinch points have been identified along the route of C2, between Haymarket and Potterrow via Morrison Street and Lauriston Place. These make the early delivery of this section challenging. Nevertheless, the corridor remains an important longer term opportunity.

Section C3 connects the Newhaven and South East corridors via Leith Street, providing greater service reliability and flexibility. Without this additional infrastructure, future tram operation is sub-optimal and proposed service frequencies would result in significant pedestrian conflict on Princes Street.

#### 7.2.8 Recommendations

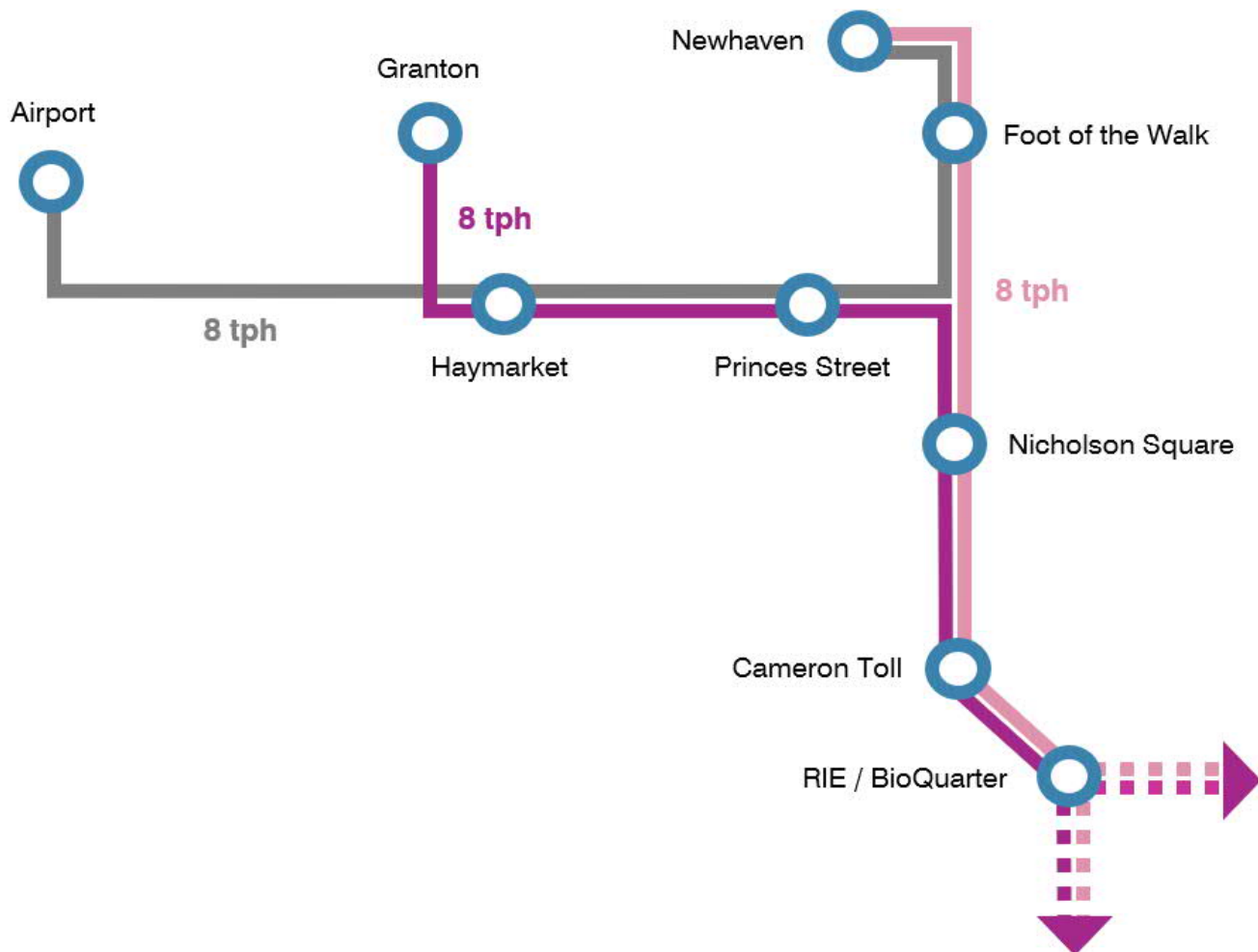
The following table summarises the recommendations and rationale for Section C and its associated options.

**Table 7.1: Section C Recommendations**

	Option	Recommendation	Rationale
C1	Princes St to Nicolson Square via Princes St/ Bridges	Consider in greater detail	Safeguarded route. Provides direct from existing route towards southeast Edinburgh. Provides North/ south connectivity between Newcraighall/ Shawfair and Newcraighall
C2	Haymarket to Nicholson Square via Lauriston Place	Reject	Pinchpoints identified above make delivery difficult and costly in short/ medium term. Route has strong potential passenger demand and planning/ redevelopment should consider future provision.
C3	North Bridge to Picardy Place via Leith St	Consider in greater detail	Compliments C1 and provides improved north/ south connectivity and operational flexibility. Reduces potential transit operating constraint and pedestrian conflicts at Princes St/ South St Andrew Street

Given the deliverability issues of Section C2, it is recommended that C1 is taken forward for further development in combination with Section C3. In combination, these provide a range of service pattern options, as shown in Figure 7.2 below.

Figure 7.2: Potential Tram Service Pattern



## 8. Recommendations and Next Steps

### 8.1 Summary of Recommendations – Tram Options

Table 8.1 summarises the tram options considered as part of this study, the recommendation relating to each and proposed next steps.

**Table 8.1 Summary of Tram Option Recommendations**

	Option	Outcome	Recommendation/ Rationale
A1	Crewe Toll to Caroline Park via segregated route parallel to West Granton Access Road	✓	Consider in greater detail
A2	Crewe Toll to Caroline Park via on-street alignment on Crewe Road North	✗	Not viable due to significant engineering required at Crewe Toll to enable transit to traverse the junction
A3	Crewe Toll to Caroline Park via segregated alignment on Pennywell Road.	✗	Not viable due to long journey time and high level of conflict with utilities compared to A1
B1a	Shandwick Place to Crewe Toll via NCN1 and Telford Path (do minimum)	✗	Not viable due to poor level of active travel provision and negative impact on valued local environmental asset
B1b	Shandwick Place to Crewe Toll via NCN1 and Telford Path (Do maximum)	✓	Consider in greater detail including detailed consideration of identified sub option
B2	Shandwick Place to Crewe Toll via Orchard Brae	✓	Consider in greater detail
C1	Princes St to Nicolson Square via Princes St/ Bridges	✓	Consider in greater detail
C2	Haymarket to Nicholson Square via Lauriston Place	✗	Consider at a later date as Option C1 meets requirements in medium term at lower cost
C3	North Bridge to Picardy Place via Leith St	✓	Consider in greater detail
D1	Nicolson Square to BioQuarter via on-street alignment	✓	Consider in greater detail
E1a	BioQuarter to Newcraighall via largely segregated route	✓	Consider in greater detail including identified sub options
E1b	BioQuarter to Sheriffhall via mixed on-street and segregated alignment	✓	Consider in greater detail including identified sub options
E1c	BioQuarter to Sheriffhall via Shawfair on segregated alignment	✓	Consider in greater detail including identified sub options

Route sections being take forward to the Strategic Business Case are shown in Figure 8.1.

### 8.2 Consideration of Alternative Transit Modes (BRT)

This report has considered route options as above, and shortlisted those recommended for more detailed assessment. While the focus of the outline feasibility work undertaken as part of this commission has focused on whether a tram alignment can be secured, as part of any further work modal alternatives will need to be developed and considered for each of the corridors.

This will primarily need to consider the development of an appropriate BRT option (to compare with tram) which seeks to meet the same core objectives. In terms of route option development this would entail:

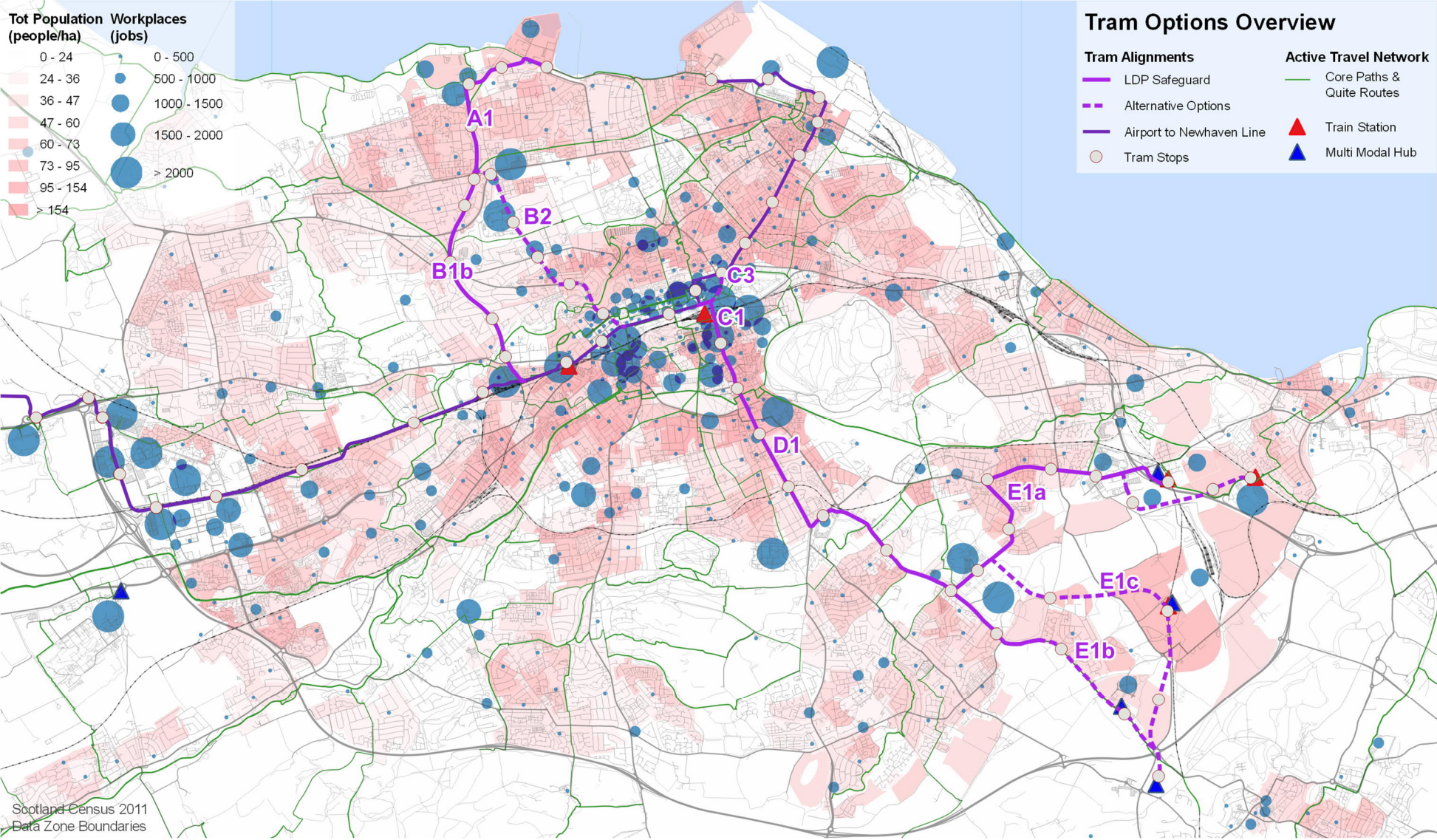
- Consideration of BRT alternative in each corridor (Granton and South East).
- Consideration of routing to, within and across the city centre.
- Consideration of BRT at a network level.

Options would then be considered on a consistent basis (STAG compliant) to identify a preferred mode option, or potentially combination of options.

It is likely that the BRT options, while serving the same corridors, would have different route alignment solutions reflecting, in part, the interaction with the existing tram network. For example:



Figure 8.1: Recommended Route Alignments



- Whereas tram options can utilise the existing city centre infrastructure, BRT overlaid on this would create different challenges. As such, an alternative 'cross city' route may be more appropriate for a BRT option. This could, for example, entail consideration of C2 as a cross-city BRT route.
- Whereas tram from Granton via the Roseburn viaduct connects well into the existing tram alignment route, a BRT option via this corridor would be challenging to deliver. We can however say that the prospective route via Orchard Brae is suitable as both tram and BRT. This suggests that the selection of one mode over the other at this stage is premature.
- In the South East corridor the greater route flexibility of BRT could support onward services from the Bio-Quarter to several corridors e.g. towards Dalkeith, Newcraighall and Shawfair.

A fundamental consideration will be whether BRT provides sufficient corridor capacity and operational efficiency within the busiest section of the network between the inner South East corridor and city centre, that is able to address the current challenges faced (related to 80 to 100 buses per hour on some section) and to support wider objectives around supporting future growth, tackling climate change and delivering the transformation of the city centre.

It is also possible that tram and BRT solutions could, in tandem, form complementary functions serving the broad South East quarter through the city centre and beyond.

### 8.3 Next Steps – Development of the Strategic Business Case

The next stage of the ESSTS Study is to prepare a Strategic Business Case for future transit. This scoping stage will be based around the five case model:

- Strategic Case
- Economic Case
- Commercial Case
- Financial Case
- Management Case

A proposed Work Breakdown Structure is shown in Figure 8.2 and a summary of the proposed approach is given in Table 8.2.

A key early task will be to build on the work to date to complete the evidence base supporting the strategic case for transit. This will focus on existing public transport capacity, journey times and the ability to support future city growth. Analysis will summarise the opportunity that transit/ wider investment provides in addressing problems/ challenges.

Technical work will explore the challenges in delivering transit, in particular it will consider operational constraints through the Bridges corridor and how these impact on stakeholders and residents. Analysis will also consider potential transit journey times and how these compare with existing modes.

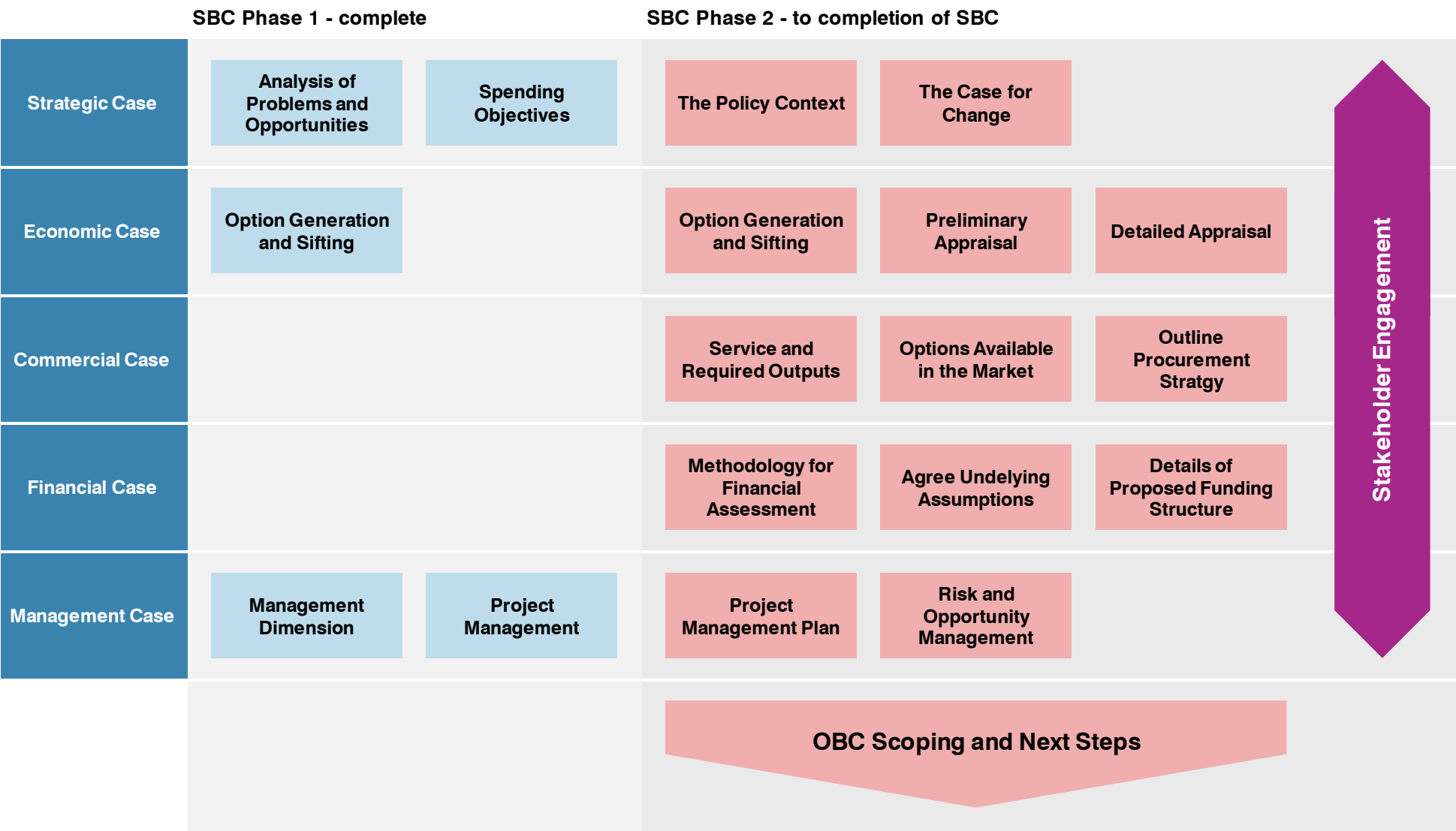
Together with initial costings, outputs will help to start to build the economic case for the scheme. Potential options will be appraised against STAG criteria and further refined as part of the economic appraisal of preferred option(s).

The commercial case will consider procurement options, the financial case will set out capital costs, revenues and funding strategies.

The management case will include a Project Management Plan, Programme and Work Breakdown Structure, outlining governance, decision-making and consultation.



Figure 8.2: Work Breakdown Structure



**Table 8.2: SBC Five Cases and Approach**

Output	Approach
<b>Strategic Case</b>	
Quantification of Existing and future problems and opportunities	<ul style="list-style-type: none"> <li>• Develop compelling evidence base through use of existing models &amp; analysis (e.g. STPR2, ESSTS P1&amp;2), evidence and data, benchmarking, bespoke analysis where gaps identified</li> <li>• Existing problems e.g. bus capacity, JTs, accessibility and impact on uses/ outcomes</li> <li>• Future challenges i.e. impact of future growth in absence of intervention i.e. exacerbate existing problems; failure to deliver outcomes (carbon, sustainable growth).</li> <li>• Opportunity that transit/ wider investment provides in addressing problems/ challenges.</li> </ul>
The Policy Context	<ul style="list-style-type: none"> <li>• Review of current and emerging city and regional policies</li> </ul>
SMART Transport Planning Objectives	<ul style="list-style-type: none"> <li>• Review and refine existing TPOs in light of above tasks</li> <li>• Develop CSFs, metrics (logic mapping principle) that can be used to assess option performance</li> </ul>
Dependencies and Constraints	<ul style="list-style-type: none"> <li>• Role of transit as integral part of City Mobility Plan/ City Plan 2030 – interdependent at policy/ network level</li> <li>• Dependencies and constraints at route level (Masterplans, other modes, feasibility constraints) – this links to the ‘proof of concept’ points above</li> </ul>
Understanding of Stakeholder views	<ul style="list-style-type: none"> <li>• Targeted workshops and 1-2-1s with key stakeholders.</li> <li>• Option for public engagement linked to City Plan</li> </ul>
<b>Economic Case</b>	
Sifted Options	<ul style="list-style-type: none"> <li>• Continue previous work to confirm previous sifting and refine options further</li> </ul>
Preliminary Appraisal	<ul style="list-style-type: none"> <li>• Appraise against STAG criteria, largely qualitative based to refine options further</li> <li>• This will involve refinement/ development of work undertaken to date, supported by the enhanced evidence base developed as part of the Strategic Case.</li> </ul>
Refined Modelling tools	<ul style="list-style-type: none"> <li>• Review growth projections and city region development plan to update existing models</li> <li>• Develop agreed Do Minimum</li> <li>• Outline capital and operating costs</li> <li>• Prepare demand, revenue and benefit forecasts for preferred option(s)</li> </ul>
Detailed Appraisal	<ul style="list-style-type: none"> <li>• Appraise STAG criteria, largely quantitative based to refine options further</li> <li>• Prepare economic appraisal of preferred option(s)</li> </ul>
<b>Commercial Case</b>	
Procurement options	<ul style="list-style-type: none"> <li>• Undertake benchmarking of similar schemes incl. Tram Completion</li> </ul>
Draft commercial strategy	<ul style="list-style-type: none"> <li>• Consider available options</li> </ul>
<b>Financial Case</b>	
Capital and whole life scheme costs	<ul style="list-style-type: none"> <li>• Set out capital costs and ongoing revenues/ operating costs</li> </ul>
Detail the proposed funding structures	<ul style="list-style-type: none"> <li>• Outline funding options and overall funding strategy</li> <li>• Agree and record underlying assumptions</li> </ul>
<b>Management Case</b>	
Project management plan	<ul style="list-style-type: none"> <li>• Programme and Work Breakdown Structure</li> <li>• Governance and decision-making</li> <li>• Consultation</li> </ul>
Risk and Opportunities Register	
Outline Construction Delivery Strategy	