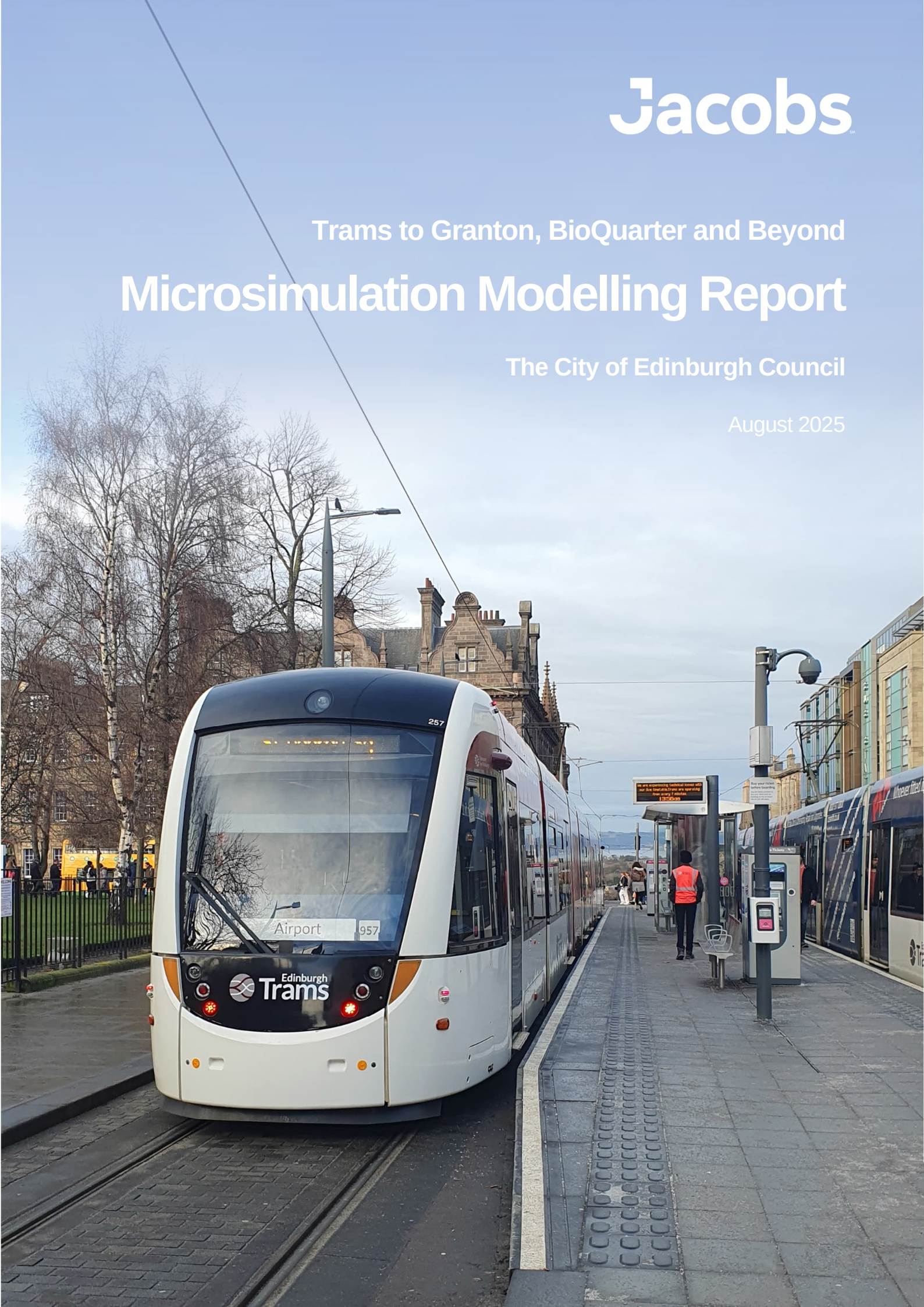
Jacobs

Trams to Granton, BioQuarter and Beyond

Microsimulation Modelling Report

The City of Edinburgh Council

August 2025



Trams to Granton, BioQuarter and Beyond Microsimulation Modelling Summary

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1. Introduction

1.1 Purpose of this Report

This report summarises the development of a series of microsimulation models to support design development for the Trams to Granton, BioQuarter and Beyond project.

Microsimulation modelling requires relatively detailed data on scheme layout and operation. This necessitates a series of design assumptions to be made that will later be developed fully at Outline Business Case stage. Microsimulation modelling helps identify potential operational issues emerging from early design assumptions, and the development of alternative mitigation strategies. The result is the identification of a realistic and workable scheme at a much earlier stage in the design process.

At this Strategic Business Case (SBC) stage, we are referring to all work to date as a Candidate Design, with one for each corridor. It is fully acknowledged that each will be subject to further refinement and, ultimately, to the relevant statutory procedures before they could be implemented. Similarly, as the design is refined at later stages, it should be expected that model outputs will change to reflect the refinements. Nevertheless, the results from this microsimulation modelling exercise give clear indication of the relative route performance and operational impacts.

Microsimulation has helped identify key network constraints and inform potential junction strategies, stop locations and wider placemaking opportunities. Models have also helped determine tram journey times on each section of the route. These have subsequently been incorporated into the strategic modelling for the project, informing forecast tram patronage, and supporting the wider Strategic Business Case.

1.2 Model Sections

Three models have been developed covering the full north-south tram route (excluding the existing city centre which is modelled separately as part of the original scheme):

- Orchard Brae - Granton to Princes Street via Waterfront Avenue, West Granton Access, Crewe Toll, Crewe Road South, Orchard Brae, Queensferry Road, Queensferry Street, connecting with the existing tram route at Princes Street
- Roseburn - Granton to Haymarket via Waterfront Avenue, West Granton Access, Crewe Toll, Roseburn Path, connecting with the existing tram route near Russell Road
- South East - South St Andrew Street Junction, North Bridge, South Bridge, Clerk Street, Minto Street, Craigmillar Park Lady Road (Cameron Toll) Old Dalkeith Road, Little France Drive (Royal, Infirmary, Edinburgh / BioQuarter)
    - **Beyond the BioQuarter, a connection to Shawfair railway station has been assumed in all transport modelling / passenger forecasting**, although an alternative route / future extension to Queen Margaret University via Craigmillar is also under consideration.
    - The rationale for a link to Shawfair is the connectivity to the Borders Railway that this provides. A tram connection provides important regional connectivity, linking the rail network to the Royal Infirmary, the BioQuarter, and south Edinburgh.

A map of the route sections is given in Figure 1.1. Tram alignments and stop locations will be subject to change as concept / candidate designs are refined through future stages of the project.

Figure 1.1: Trams to Granton, BioQuarter and Beyond Route Overview

The Orchard Brae tram route is largely on-street. A VISSIM model of this corridor was created in the first instance, and calibrated to 2023 turning count data. The northern section of the model has then been used to develop a Roseburn corridor model, which otherwise includes a fully off-street tram connection between Crewe Toll and Haymarket.

The South East model was originally developed to support public transport and active travel improvements on the A7 / A701 corridor. This model is therefore older and has been calibrated to 2016 turning count data. The model will be fully updated to new data at a future stage to support both tram and other shorter-term interventions.

1.3 Model Software and Time Periods

All models have been developed to run using VISSIM 24. Model time periods are:

Orchard Brae and Roseburn

- AM 08:00-09:00 with a 30-minute warm-up period
- PM 17:00-18:00 with a 30-minute warm-up period

South East

- AM 08:00-09:00 with a 30-minute warm-up period

2. Orchard Brae

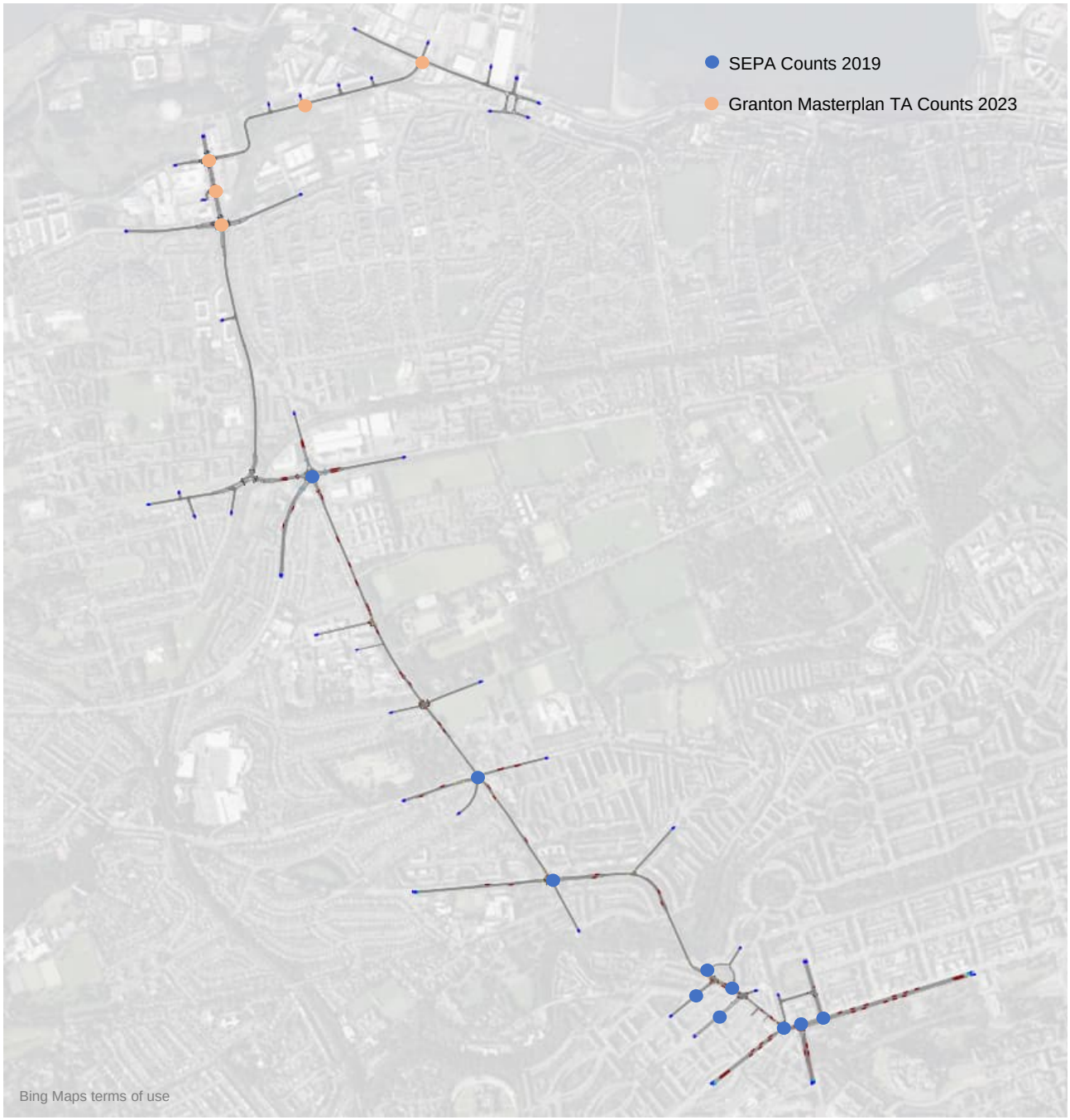
2.1 Base Network

The Orchard Brae base model network is shown in Figure 2.1 and extends from Granton to Princes Street via Waterfront Avenue, West Granton Access, Crewe Road South, Orchard Brae, Queensferry Road and Queensferry Street to Princes Street.

The network has been developed from digital mapping; signal staging and timings were provided by the City of Edinburgh Council.

Bus routes reflect autumn 2024 timetables, and include Lothian, Stagecoach, Citylink and Edinburgh Coach Line Services along the corridor.

Figure 2.1: Base Model Network and Traffic Count Locations



All speed limits are based on 2024 restrictions, with additional speed reductions reflecting junction geometry and specific network constraints.

Traffic count data has been obtained from two sources:

- 2019 SEPA counts – Princes Street to Crewe Toll
- 2023 Granton Masterplan Transport Assessment counts – West Granton Road / West Granton Access to Waterfront Avenue / West Harbour Road

Count locations are indicated in Figure 2.1 above.

2.2 Matrix Development and Model Calibration

Matrix development and model calibration followed a 5-step process.

1) Cordoning

Initial matrices were cordoned from the Council's Strategic VISUM model. Matrix factors were used to disaggregate output matrices into 15-minute periods. An indicative taxi matrix was also generated (assumed to be 5% of the original car matrix) in order to capture the impact of specific bus and taxi restrictions.

Table 2.1: AM Matrix Disaggregation Factors

Time	Car	Taxi	LGV	HGV
07:30	0.2247	0.0118	0.2365	0.2365
07:45	0.2247	0.0118	0.2365	0.2365
08:00	0.2404	0.0127	0.2530	0.2530
08:15	0.2374	0.0125	0.2499	0.2499
08:30	0.2366	0.0125	0.2491	0.2491
08:45	0.2356	0.0124	0.2480	0.2480
Total	0.95	0.05	1.00	1.00

Table 2.2: PM Matrix Disaggregation Factors

Time	Car	Taxi	LGV	HGV
07:30	0.2198	0.0116	0.2314	0.2314
07:45	0.2198	0.0116	0.2314	0.2314
08:00	0.2462	0.0130	0.2592	0.2592
08:15	0.2393	0.0126	0.2519	0.2519
08:30	0.2337	0.0123	0.2460	0.2460
08:45	0.2308	0.0121	0.2429	0.2429
Total	0.95	0.05	1.00	1.00

2) Initial assignment

An initial assignment was undertaken in VISSIM, with resulting paths exported to VISUM for matrix estimation below.

3) Matrix Estimation

Processed turning count data was imported into VISUM from an Excel based format. A matrix estimation process was undertaken to adjust each demand matrix to better reflect count data (Figure 2.2). Matrices were then exported for further assignment in VISSIM.

Figure 2.2: Assigned VISUM Network for Matrix Estimation

4) Post Matrix Estimation Base Model

Matrix estimated matrices were next assigned in VISSIM to review model performance and to ensure that models operated without unintended issues (e.g. vehicles blocking the network) and that levels of queuing reflected real-world network congestion.

Node evaluation results were exported for comparison with turning counts in Excel, as below.

5) Model Calibration

Modelled light vehicles (car, taxi + LGV) and total traffic flows have been calibrated against the observed count data based on WebTAG Percentage Difference and GEH criteria.

Percentage difference and GEH criteria are defined in Table 2.3.

Table 2.3: AM Matrix Disaggregation Factors

Criteria	Description	Guideline
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	> 85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/h	> 85% of cases
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	> 85% of cases
2	GEH < 5 for individual flows	> 85% of cases

A high level of model calibration has been achieved, as shown in Table 2.4. In both morning and evening peaks, comparing observed and modelled flows, 133 out of 134 locations pass the percentage difference criteria.

A full summary of calibration results by junction is given in Appendix A.

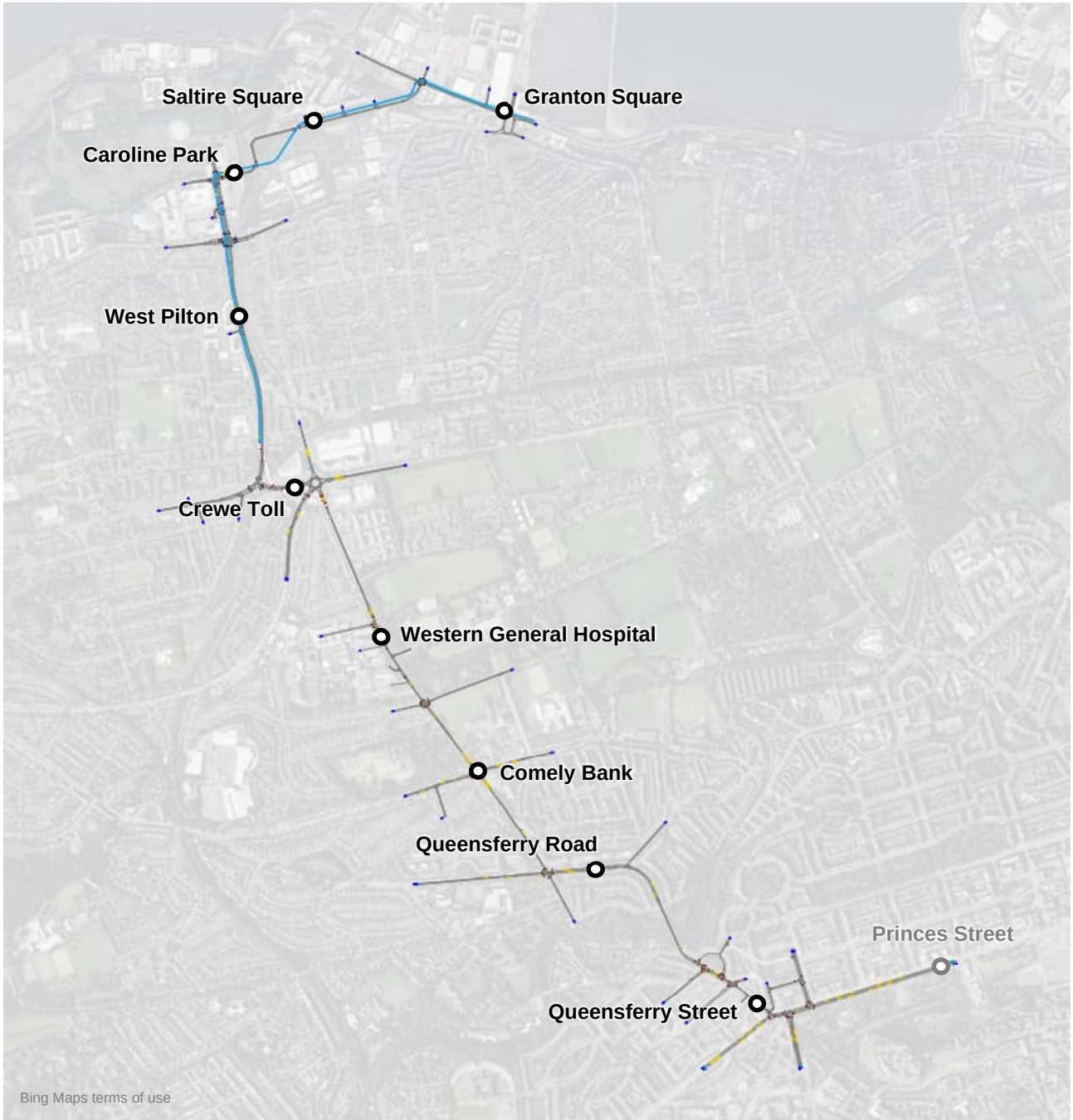
Table 2.4: Model Calibration Results

	% Difference				GEH			
	AM 08:00-09:00		PM 17:00-18:00		AM 08:00-09:00		PM 17:00-18:00	
	Lights	Total	Lights	Total	Lights	Total	Lights	Total
No of counts pass	133	133	133	133	133	133	130	130
Total counts	134	134	134	134	134	134	134	134
% Pass	99%	99%	99%	99%	99%	99%	97%	97%

2.3 Tram Design and Assumptions

The Do-Something (With-Tram) network is shown in Figure 2.3.

Figure 2.3: Orchard Brae With-Tram Network



Starting from the city centre, the tram route diverges from the existing line at Shandwick Place, west of Princes Street and Lothian Road. Travelling northwards, proposed tram stops are located at:

- Queensferry Street
- Queensferry Road
- Comely Bank
- Western General Hospital
- Crewe Toll
- West Pilton
- Caroline Park
- Saltire Square
- Granton Square

Geometric constraints mean that only an east facing junction can be delivered between Queensferry Street and Princes Street. No direct connection would be possible between Queensferry Street and Shadwick Place.

Travelling from the Granton corridor to the West End, Haymarket and all stops beyond to the airport would require interchange at Princes Street. Operations are complicated by trying to merge two tram routes at the busy Princes Street / Lothian Road / South Charlotte Street junction. It has not been possible to develop a robust signal strategy for tram that does not significantly impact on wider traffic movements, including bus.

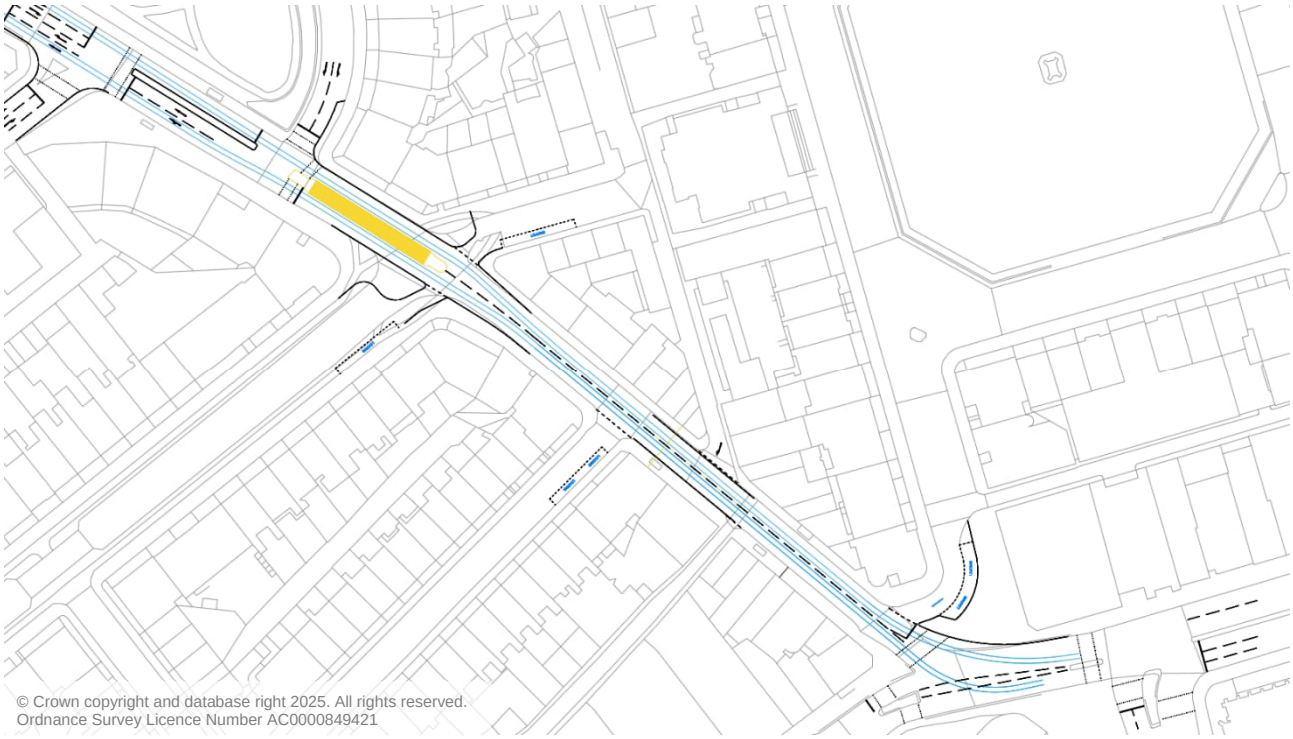
The proposed tram stop at Queensferry Street requires the relocation of busy bus stops to other locations. Given the longer dwell times of regional and express services, the modelled proposals are likely to create a major real-world operating constraint, increasing bus journey times, general traffic congestion, directly impacting on tram reliability.

Limited bus stop capacity will restrict future bus passenger growth on the corridor. Stagecoach services from Fife continue to increase, and Lothian and Lothian Country services are expected to expand as a result of development across the Waterfront and around Queensferry. Alternative stop locations have been considered including Charlotte Square and Melville Street, but these are considered unacceptable due to streetscape and heritage impacts. Options to maintain adequate bus stop capacity on the Queensferry Road corridor and into the city centre will need to be considered in detail as part of an Outline Business Case should the Orchard Brae route be taken forward.

An indicative tram stop is shown on Queensferry Street in Figure 2.4; the exact position of this will need to be developed as part of a detailed design, as there are multiple trade-offs in finalising a preferred location.

Trams would then continue via Drumsheugh Place / Lynedoch Place and Dean Bridge towards Queensferry Road / Orchard Brae. Width constraints mean that no segregated active travel provision could be provided across Dean Bridge.

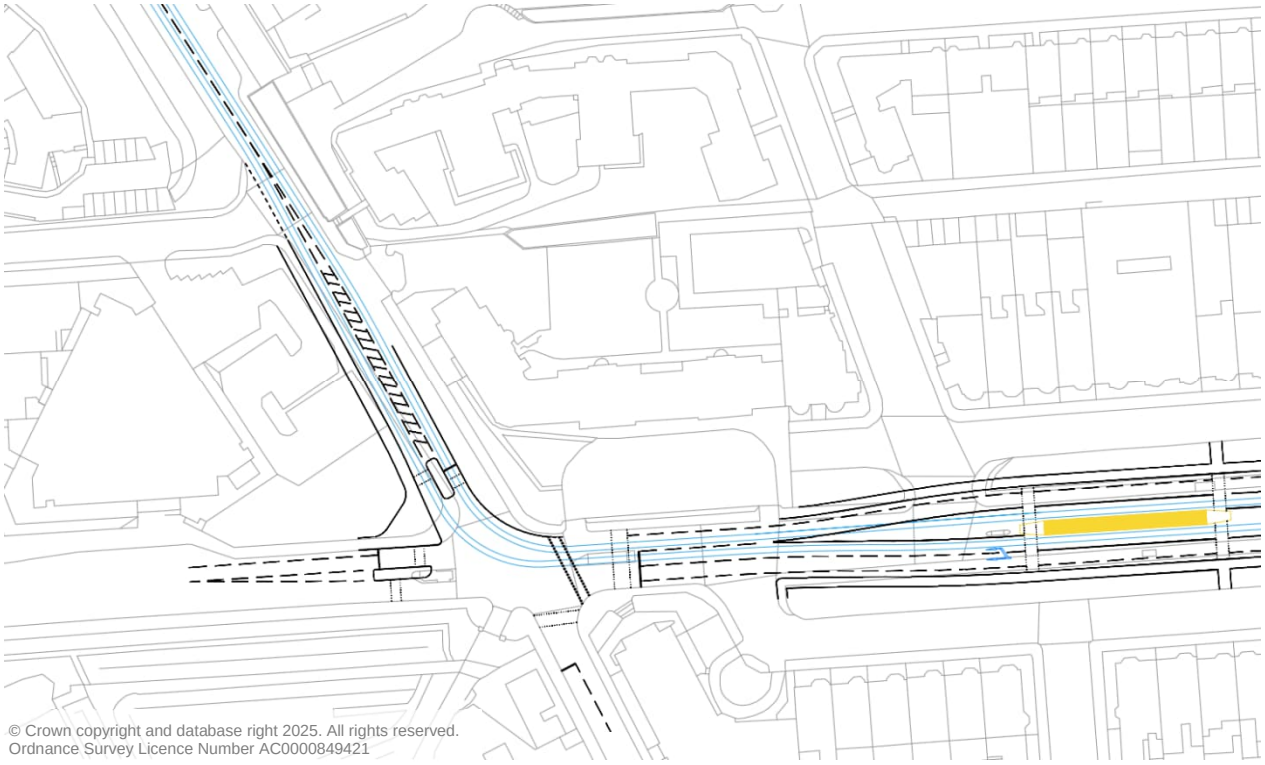
Figure 2.4: Queensferry Street



A tram stop is proposed on Queensferry Road at South Learmonth Avenue.

The junction of Orchard Brae and Queensferry Road will require careful design to accommodate trams (Figure 2.5). Typically, tram articulation can negotiate tight turns or steep gradients, but not both at the same time. Future design development may need to consider the reprofiling of the southern section of Orchard Brae to accommodate chosen tram vehicle performance.

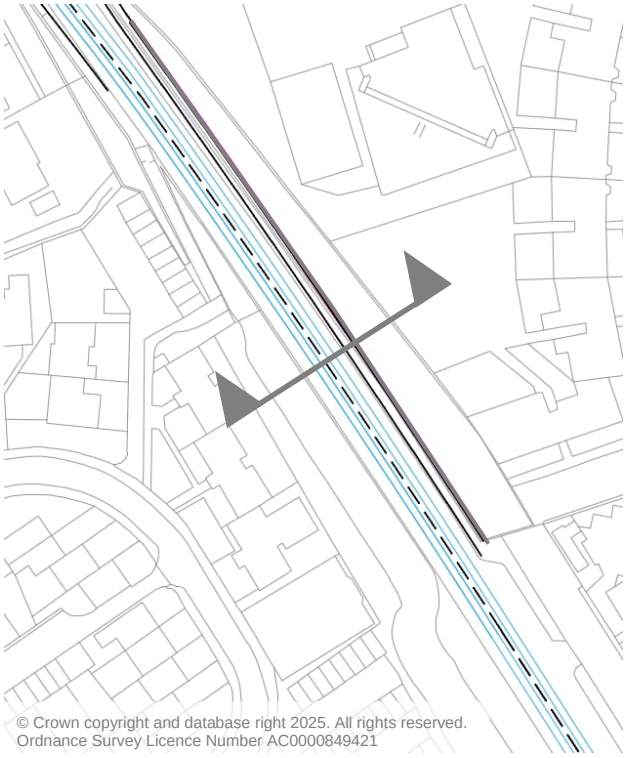
Figure 2.5: Queensferry Road / Orchard Brae

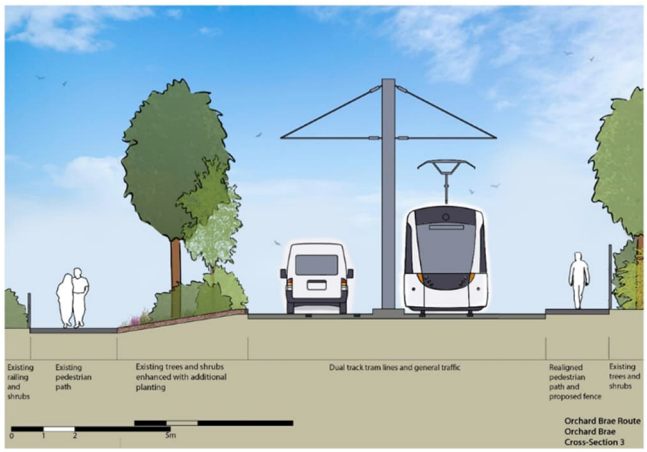


Orchard Brae was originally built for trams, with a constant 6% gradient. Due to the narrow cross-section and aforementioned gradient, no stop is proposed on this section. Instead, the next halt is on Queensferry Road, west of Learmonth Terrace.

An indicative tram cross-section is given in Figure 2.6.

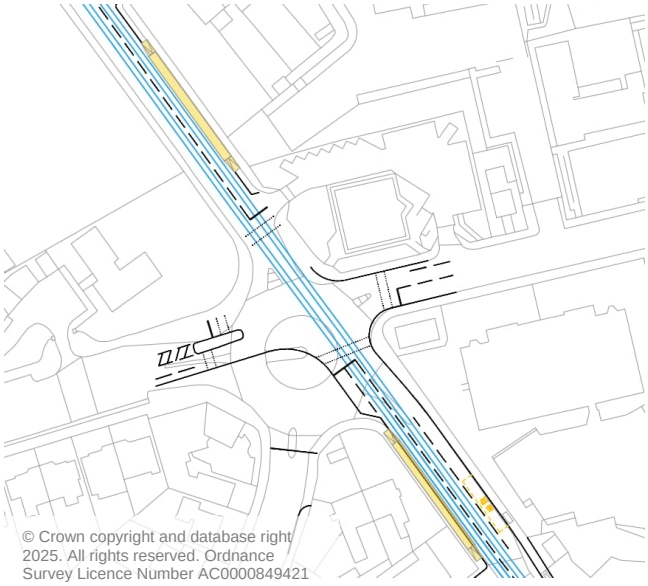
Figure 2.6 Cross-Section at Orchard Brae Looking North





Comely Bank Roundabout would be signalised, as illustrated in Figure 2.7. To minimise the number of traffic stages, (necessary to improve overall junction performance), Orchard Road would require to be stopped-up, with traffic diverted via Orchard Place or Orchard Drive. Tram platforms would be staggered either side of the junction (northbound to the south on Orchard Brae, southbound to the north on Crewe Road South) to minimise delay.

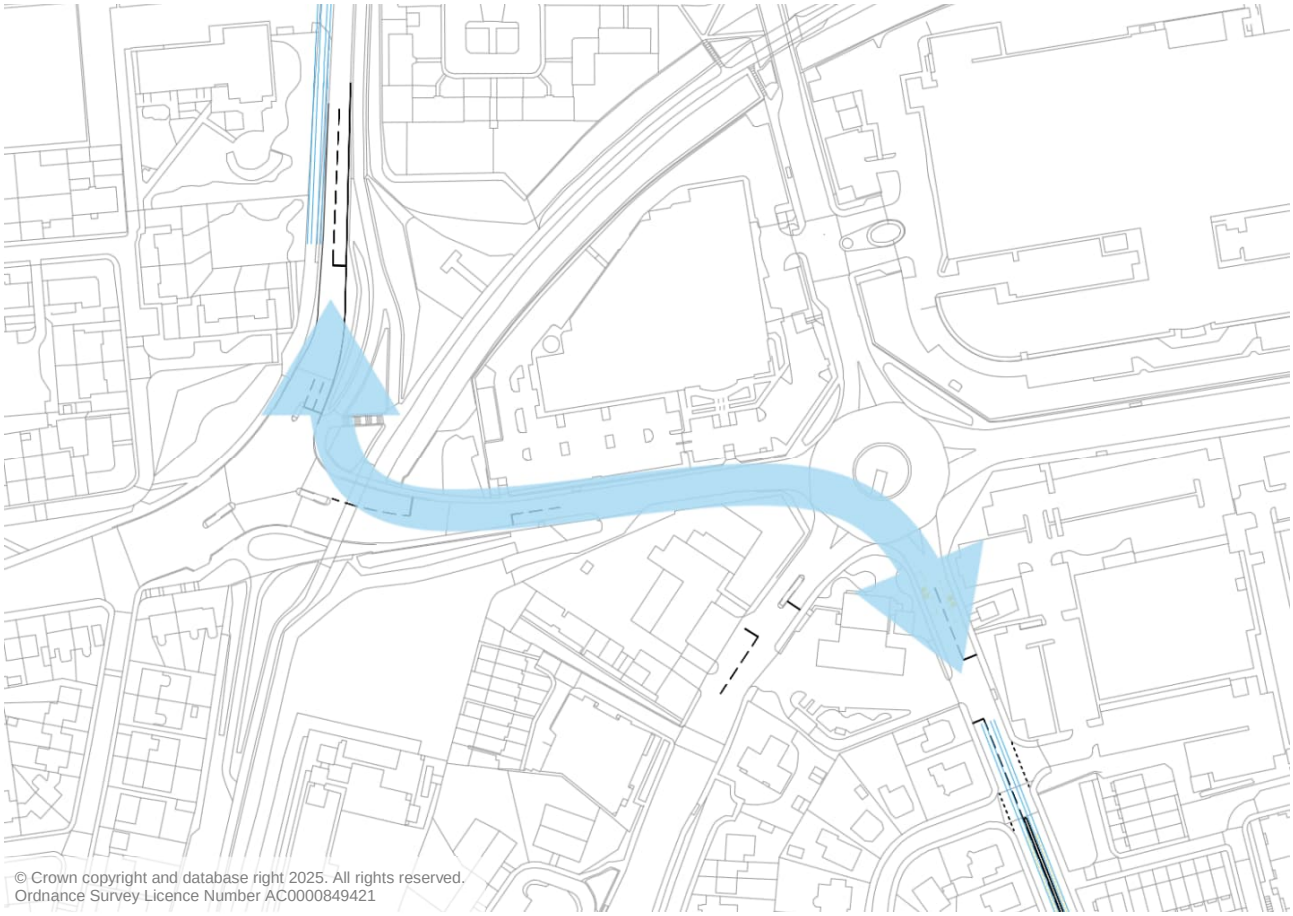
Figure 2.7: Crewe Toll Roundabout Signalisation



An overarching assumption within the design of the on-street section of the route is that uncontrolled right turn movements across the tram tracks should be minimised. All major junctions are therefore signalised. On Crewe Road South, a number of properties on the west side of the street have private driveways. How access is maintained to these will require careful consideration. A central median will be required to accommodate Overhead Line Equipment (OLE), potentially restricting access to adjacent properties to left in / left out. U-turning movements would be accommodated at Crewe Toll but the signalisation of Comely Bank Roundabout (right) makes U-turning at this location impossible. Alternatively, driveway access would remain uncontrolled, accepting the degree of risk that this solution creates.

North of Crewe Road South, the tram would continue to Crewe Toll, crossing Ferry Road, to join the West Granton Access. Microsimulation modelling has assumed that the tram alignment would avoid Crewe Toll roundabout. Nevertheless, a preferred alignment at this location has still to be determined. There are trade-offs between traffic impacts, land take and the aspiration to provide a tram stop with effective bus interchange, and walking, wheeling and cycling connectivity.

Figure 2.8: Crewe Toll / Crewe Road South



Coding of the northern section of the tram route between Ferry Road and Granton is based on the 2008 detailed design, being developed for construction at that time. Tram is largely off-street, running parallel to West Granton Access and Waterfront Avenue, with a terminus at Granton Square.

2.4 Network Performance

An illustration of network performance is given in Figures 2.9. to 2.12 below.

The Princes Street / Lothian Road and Shadwick Place / Queensferry Street junctions are two of the busiest in the city centre. Under the existing arrangement, general traffic runs north / south between Lothian Road and South Charlotte Street, with buses and trams primarily operating east / west. Being bus only, the adjacent Queensferry Street can be readily accommodated within the traffic signal staging. But coordinating new Granton to Princes Street (and reverse) tram movements is extremely challenging, particularly given the slow tram turning speeds (10kph) through the junction.

Figure 2.9: Queensferry Road to Princes Street

Figure 2.10: Crewe Road South and Orchard Brae

Figure 2.11: Crewe Toll to Queensferry Road

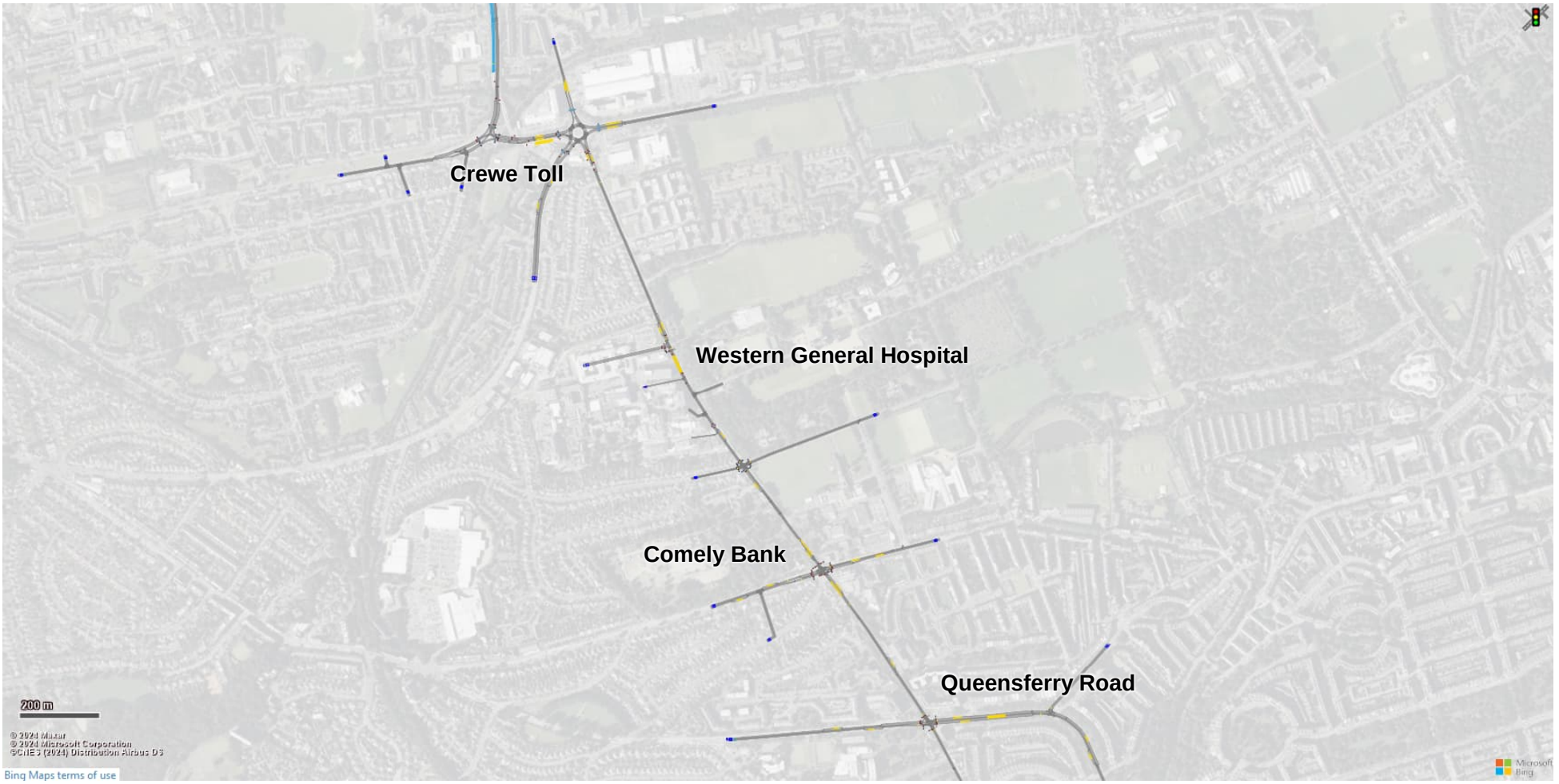


Figure 2.12: Granton to Crewe Toll

There are multiple complex junctions between South Charlotte Street and Dean Bridge. These are:

- Lynedoch Place / Randolph Crescent
- Lynedoch Place / Drumsheugh Gardens
- Drumsheugh Place / Randolph Crescent
- Queensferry Street / Melville Street
- Queensferry Street / Shandwick Place / Hope Street
- Shandwick Place / Lothian Road / Princes Street
- Princes Street / South Charlotte Street

It has not been possible to coordinate traffic signal timings to provide a green wave for tram through this section of the network. In the interpeak, delays can be minimised but, in the peak, the lane allocations and signal strategies required to accommodate tram result in significant queues citybound from Queensferry Road. These are shown in Figure 2.9 above and extend westwards to Learmonth Terrace.

A signal strategy has been developed for Queensferry Road / Orchard Brae that largely minimises queues and delays.

Figures 2.10 and 2.11 illustrate peak evening queues; traffic signals at Comely Bank, necessary to minimise the delay to trams on the north / south corridor, result in some queuing on Craigleith Road and Comely Bank.

Crewe Road South is single lane in each direction, but it has been possible to locate bus stops in laybys, limiting the impact of bus dwell times on tram journey times. Nevertheless, the restricted geometry requires that trams stop in the traffic lane to board and alight, delaying all traffic behind including buses. The impact of this arrangement on tram is somewhat mitigated by the fact that having waited at a stop for 25 seconds, the path is now clear in front, and so free flow journey times benefit. Nevertheless, overall reliability is impacted by the arrangement with a significant variation in journey times between peak and interpeak periods.

Tram would cross Ferry Road to the west of Crewe Toll roundabout. A simple two stage crossing (co-ordinated with pedestrians) minimises traffic impacts at this junction.

Between Granton and Ferry Road, the tram route is primarily off-street with simple two stage crossings across roads and accesses (Figure 2.12). The limited interaction with general traffic results in minimal network congestion and reliable tram journey times over this section.

2.5 Corridor Tram Journey Times

Based on the network performance above, resulting tram journey times are summarised in Table 2.5. The VISUM strategic model for Edinburgh tram focuses on AM peak and interpeak modelled periods. Therefore, only these time periods are discussed for the microsimulation analysis. Based on a review of observed count data, interpeak microsimulation models have been developed assuming 70% of peak period demand.

Table 2.5: Tram Journey Times – Granton to Princes Street

	AM Peak		Interpeak	
	Average	Maximum	Average	Maximum
Granton to Princes Street	34 mins	37 mins	27 mins	28 mins
Princes Street to Granton	31 mins	33 mins	27 mins	30 mins

In the peak, the average tram journey time from Granton to the Princes Street stop is 34 minutes, in the reverse direction the journey time is just under 32 minutes. In the interpeak, when congestion is reduced, the journey time is approximately 27 minutes in both directions. Network congestion therefore increases peak journey times by around 5-7 minutes or by 19-26% over free-flow conditions.

3. Roseburn

3.1 Base Network

The Roseburn Base VISSIM model network has been developed from the Orchard Brae model – the section between Granton and Crewe Toll is shared between both and trip matrices have been adjusted to reflect the amended northern section of network.

The Haymarket section of the model has been taken from a city centre VISSIM model, previously used to optimise signal timings on the existing on-street section of the route.

In between, new sections of road network have been coded at Ravelston Dykes and Queensferry Road but, since tram runs off-street along the Roseburn Path, there is no interaction with traffic at these locations.

3.2 Tram Design and Assumptions

The Do-Something (With-Tram) network is shown in Figure 3.1. The tram route diverges from the existing line at Roseburn, to the west of Haymarket. It then runs via the Roseburn Path, West Granton Access and Waterfront Avenue to Granton Square.

Proposed tram stops are located at:

- Roseburn
- Craigleith
- Telford Drive (for Western General Hospital)
- Crewe Toll
- West Pilton
- Caroline Park
- Saltire Square
- Granton Square

In addition to the above, the Roseburn alignment will serve Haymarket and West End stops prior to Princes Street. As a result, this route provides improved interchange with stops towards the airport – interchange is at Haymarket rather than Princes Street, reducing total journey times. The Roseburn corridor also better serves major office locations in the Haymarket / West End area.

A Delta Junction layout will be provided at the Roseburn junction with the existing route. This will enable trams to operate directly between the depot and Granton, increasing the flexibility of out-of-service movements. A direct passenger service between Granton and the airport is therefore possible.

Along the Roseburn Path, the corridor would be double tracked from Roseburn junction to Roseburn tram stop. From there to Craigleith, the line would be single tracked to minimise land take and the impact of the scheme on landscape and ecology. A previously proposed stop at Ravelston Dykes is also omitted for this reason.

Figure 3.2 illustrates three cross-sections between Coltbridge Viaduct and Ravelston Dykes, showing how a single tram and track and active travel provision can be accommodated within the existing track formation.

As per the 2008 design, two tracks are proposed between Craigleith and Ferry Road. The tram route then crosses Ferry Road to join the West Granton Access.

Coding of the northern section of the tram route between Granton and Ferry Road, is taken from the Orchard Brae model, which in turn is based on the 2008 detailed design. Tram is largely off-street, running parallel to West Granton Access and Waterfront Avenue.

Figure 3.1: Roseburn With-Tram Network

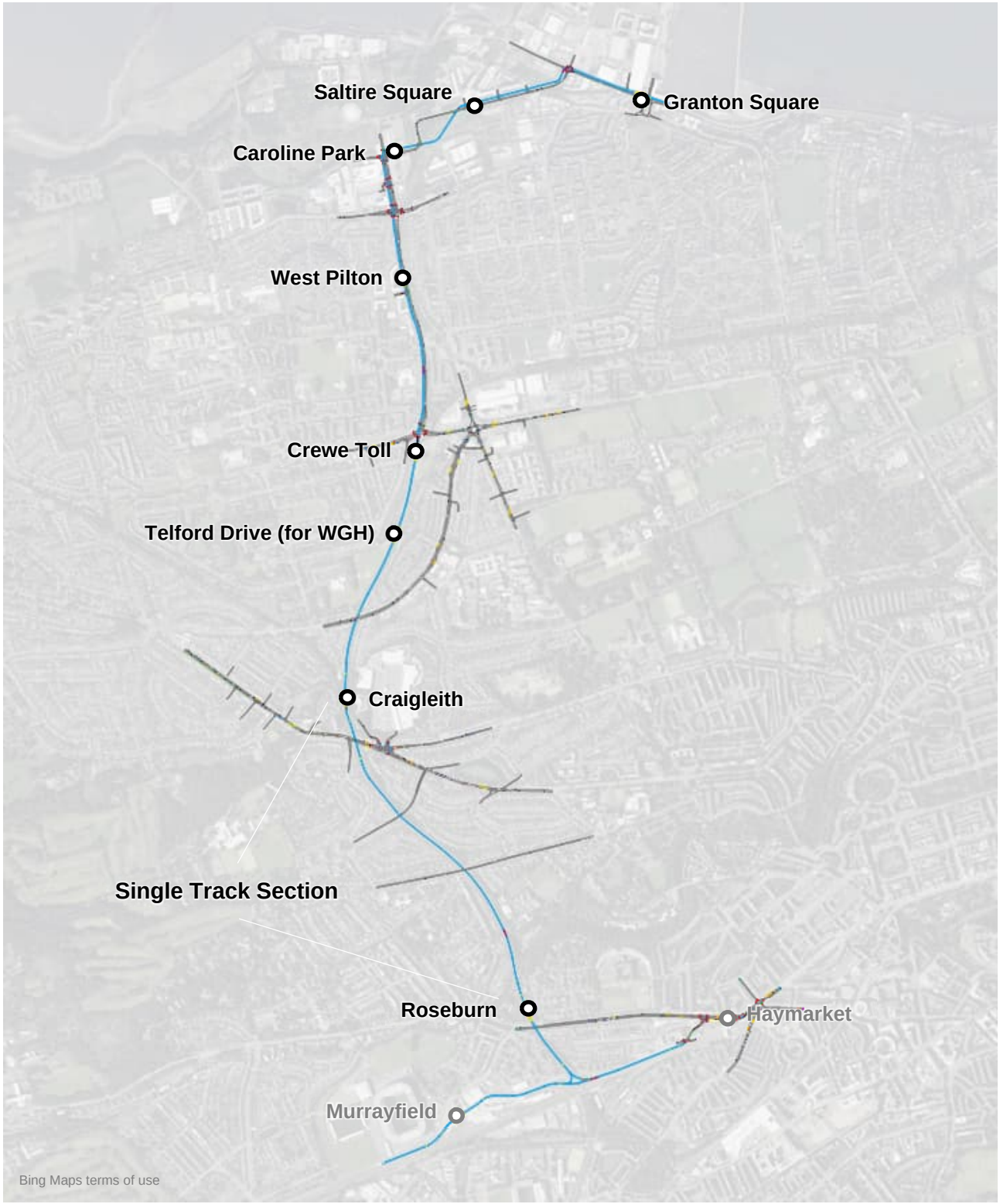
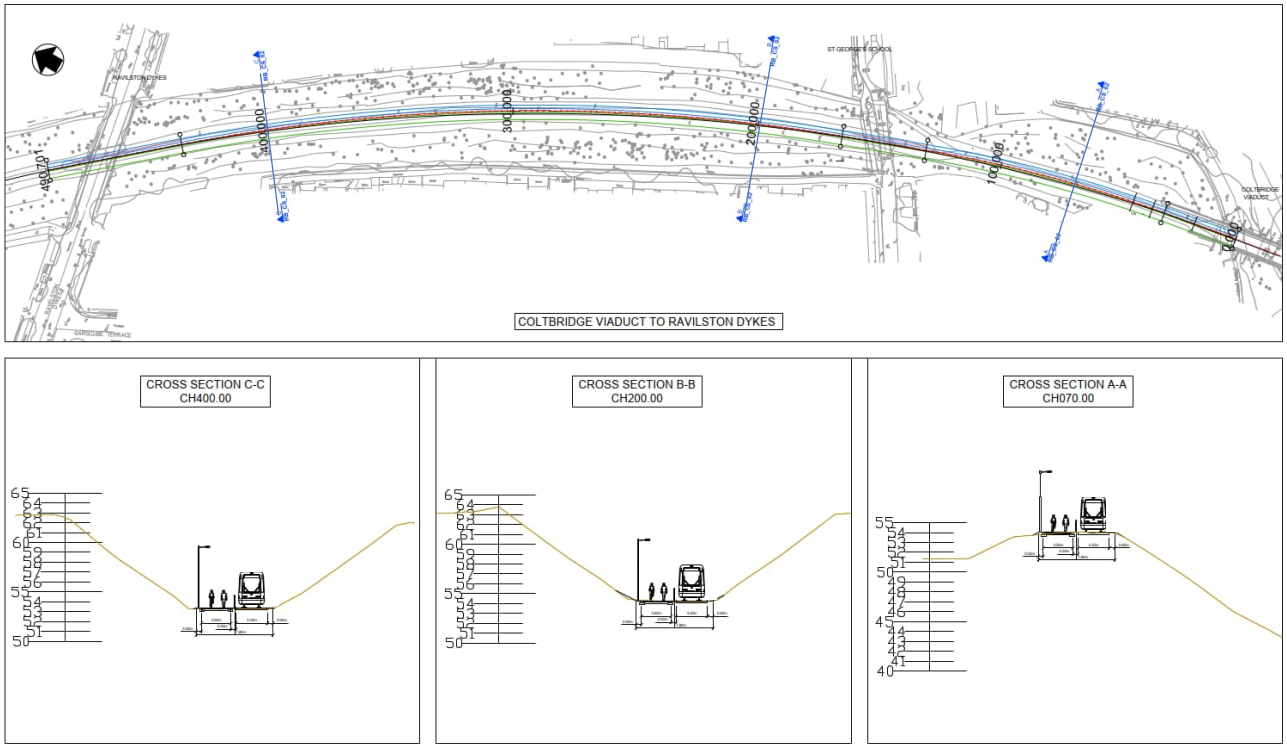
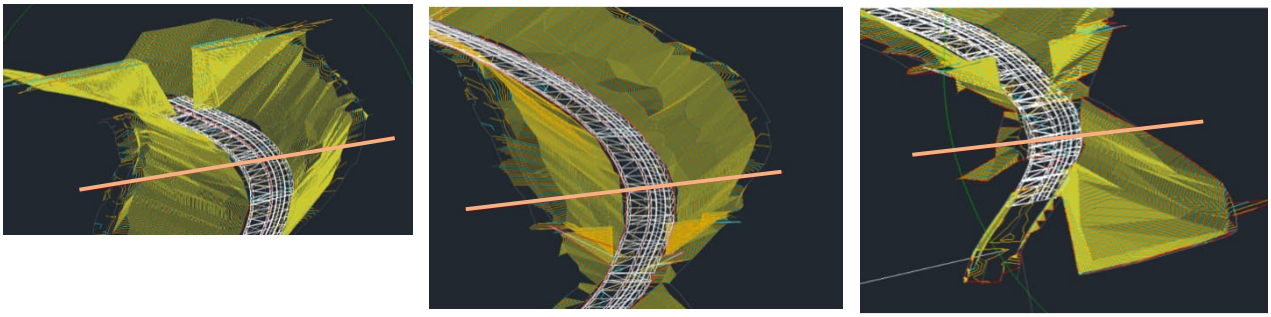


Figure 3.2: Coltbridge Viaduct to Ravelston Dykes, Cross-Section of Tram and Active Travel Path Looking North



3D Cross Sections



3.3 Network Performance

Being almost fully off-street, there is limited interaction with general traffic, resulting in more reliable journey times compared with the Orchard Brae route.

The single line section of track between Roseburn and Craigleith is a source of potential delay. The length of single tracking is approximately 1.5km. Assuming an average speed of 40kph (allowing for acceleration and deceleration at each end), the time to traverse the section would be 2:15 minutes. Hence the **maximum** delay encountered by a tram would be approximately 2 minutes 30 seconds (150 seconds).

Within the city centre, traffic signals operate on a 112.5 second cycle, the above delay is only slightly longer than a tram missing its path through a junction in the city centre.

A single-track section also helps regulate southbound trams on approach to the existing line. In this direction, there is an opportunity to coordinate trams through the new Roseburn junction reducing the total delay.

Ferry Road is the busiest road crossing, but modelling indicates that delays are minor – typically less than 30 seconds.

3.4 Corridor Tram Journey Times

Tram journey times from Granton to Princes Street are summarised in Table 3.1. Interpeak journey times have been based on 70% of peak period demand. These times include an extra 6.5 minutes between Haymarket and Princes Street tram stops (this section is not directly modelled).

Table 3.1: Tram Journey Times – Granton to Princes Street

	AM Peak		Interpeak	
	Average	Maximum	Average	Maximum
Granton to Princes Street	26 mins	27 mins	25 mins	27 mins
Princes Street to Granton	25 mins	26 mins	25 mins	26 mins

Peak and interpeak journey times are similar, reflecting the improved reliability that an off-street route provides.

In the morning and evening peak, the average tram journey time from Granton to the Princes Street stop is 26 minutes, in the reverse direction the time is approximately 25 minutes. Interpeak journey times are also around 25 minutes in both directions.

4. South East

4.1 Base Network

The south east Base microsimulation model covers the section of tram route between Princes Street and Little France Drive, as shown in Figure 4.1. The model was originally built for another study and extended only as far as Cameron Toll. For this study, the model has been expanded to include the Old Dalkeith Road to Little France Drive. No new count data has been collected on the extended section to due major road works in the vicinity of Cameron Toll at the time of model development.

Figure 4.1: South East Base Model

4.2 Model Traffic Demands and Calibration

The model is calibrated to 2016 SEPA count data. Although increasingly dated, an analysis of more recent count information highlights that there has been no significant growth on the corridor and that traffic levels have in fact reduced slightly at certain locations.

Model calibration results for the South East model are given in Table 4.1, with a more detailed summary of results by junction is given in Appendix B.

Table 4.1: Model Calibration Results, AM 08:00-09:00

	% Difference		GEH <5		GEH <7.5	
	Lights	Total	Lights	Total	Lights	Total
No of counts pass	265	263	213	209	262	260
Total counts	296	296	296	296	296	296
% Pass	90%	89%	72%	71%	89%	88%

Although less than 85% of counts have a GEH of 5 or less (a good match), several are slightly over 5. When the threshold is increased to a GEH of 7.5 (an acceptable match) over 85% of counts pass. At this stage the model is being used to identify high level junction strategies and resulting tram journey times, and the level of accuracy provided is considered appropriate for this use.

An updated VISSIM model can be developed as part of a future workstream to support an Outline Business Case for the Trams to Granton, BioQuarter and Beyond project.

4.3 Tram Design and Assumptions

A Candidate Design has been developed for significant sections of the south east tram corridor and the VISSIM modelling reflects the key assumptions within this.

The With-Tram model has been extended from Little France Drive to Shawfair via The Wisp and Millerhill to help estimate tram journey times for the full route.

As with Orchard Brae, an overarching assumption of the design is that uncontrolled right turn movements across the tram tracks should be avoided. All major junctions are therefore signalised, similar to the existing on street design.

Between the city centre and Cameron Toll roundabout, traffic signal junctions are assumed to operate on a 112.5 second cycle time, providing 32 tram paths per hour in each direction. Again, this design philosophy is consistent with the existing on-street section of tram corridor between Haymarket and the Foot of the Walk.

Figure 4.2: Illustrates the route corridor and proposed stop locations. Stops are:

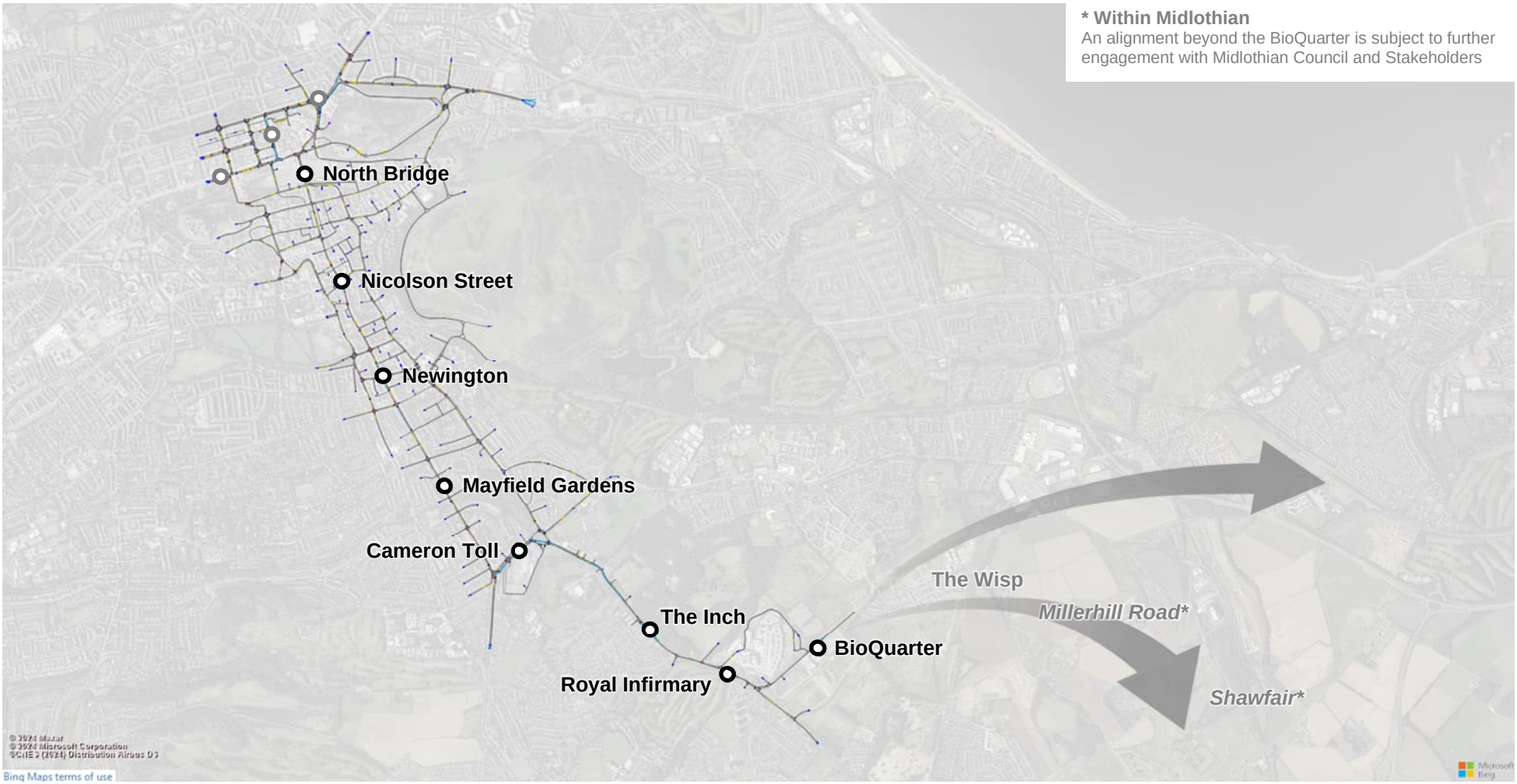
- North Bridge
- Nicolson Street
- Newington
- Mayfield Gardens
- Cameron Toll
- The Inch
- Royal Infirmary
- BioQuarter
- The Wisp
- *Millerhill Road - Midlothian*
- *Shawfair Station - Midlothian*

A Delta Junction would be created at Princes Street / South St Andrew Street, providing an all-movements connection to the existing network. The tight radii mean that turning tram speeds will be limited to a maximum of 10kph. Multiple conflicting tram movements and the need to provide sufficient pedestrian and general traffic green time means that this junction is a potential constraint on tram capacity.

A tight radius curve is also required turning the corner from Princes Street to North Bridge. Tracks require to be slewed northwards (towards the Apple Store) reducing the footway width at this location.

The above geometric requirements mean that it is not possible to introduce segregated cycling on the north side of east Princes Street. Instead, it might be possible to accommodate cycling on the south side of Princes Street, although this would impede access to Waverley Steps and the Balmoral Hotel.

Figure 4.2: South East With-Tram Network



In accordance with the Council's Circulation Plan, it has been assumed that between North Bridge and Cameron Toll the corridor will not be a primary cycle route. Instead, the corridor will be prioritised for public transport, including both bus and tram. To support this, and in accordance with the plan, a modal filter is proposed in the vicinity of North Bridge, restricting access to only buses, trams and taxis. In doing so, the section of South Bridge, north of Chambers Street, would be open for deliveries and local access only, with an exit via Blair Street.

A tram stop would be provided on North Bridge, as shown in Figure 4.3. Tram stop platforms would be offset to minimise the cross-section, maximising footway space. It is assumed that direct lift access would be provided between the tram stop and Waverley Station, delivering a high-quality interchange. This feature was a key element of City Centre Transformation. It would improve access between the station and the Old Town, which is currently difficult, especially for passengers with reduced mobility or with luggage.

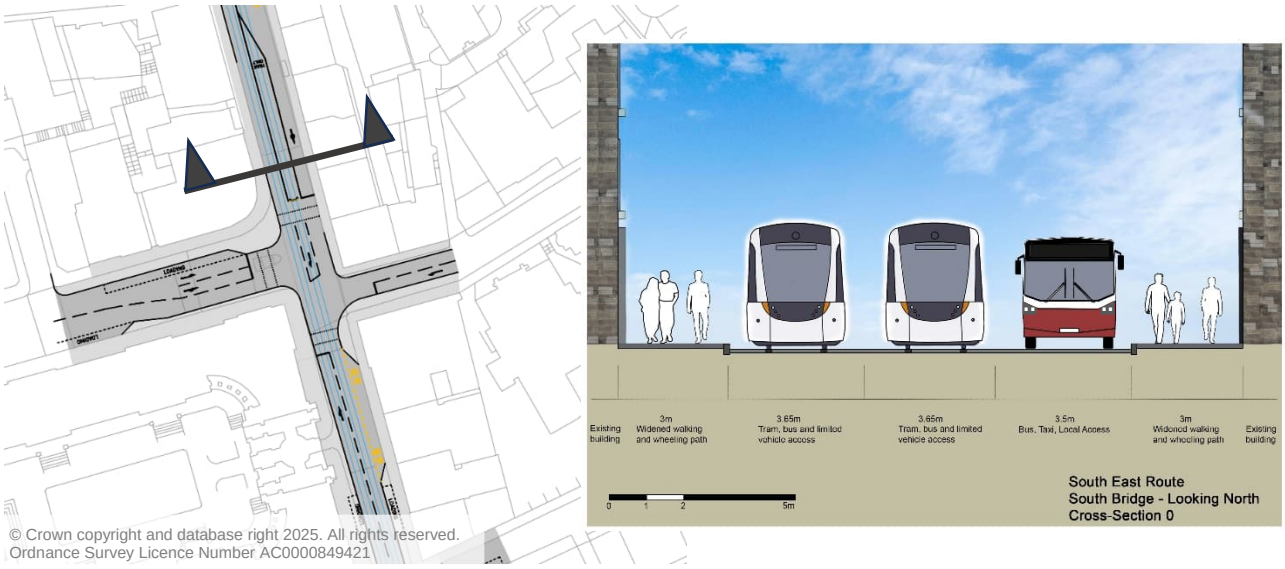
There is a desire to deliver segregated cycling over North Bridge. Nevertheless, provision can only be confirmed as part of the development of a detailed design, at a future stage. Specific tram geometric constraints and stop requirements may require additional width, making it impossible to deliver segregated cycle lanes within the constrained width of the bridge. Providing suitable segregated cycling crossing facilities at the Princes Street / North Bridge junction will also be challenging.

Figure 4.3: North Bridge Trams Stops

On the South Bridge section, the design seeks to improve pedestrian provision, with widened footways. This is achieved by reducing the number of traffic lanes from four to three (or two where bus stops and loading is provided). Doing so helps address a specific issue at bus stops, where it is almost impossible for pedestrians to pass waiting passengers without stepping into the roadway.

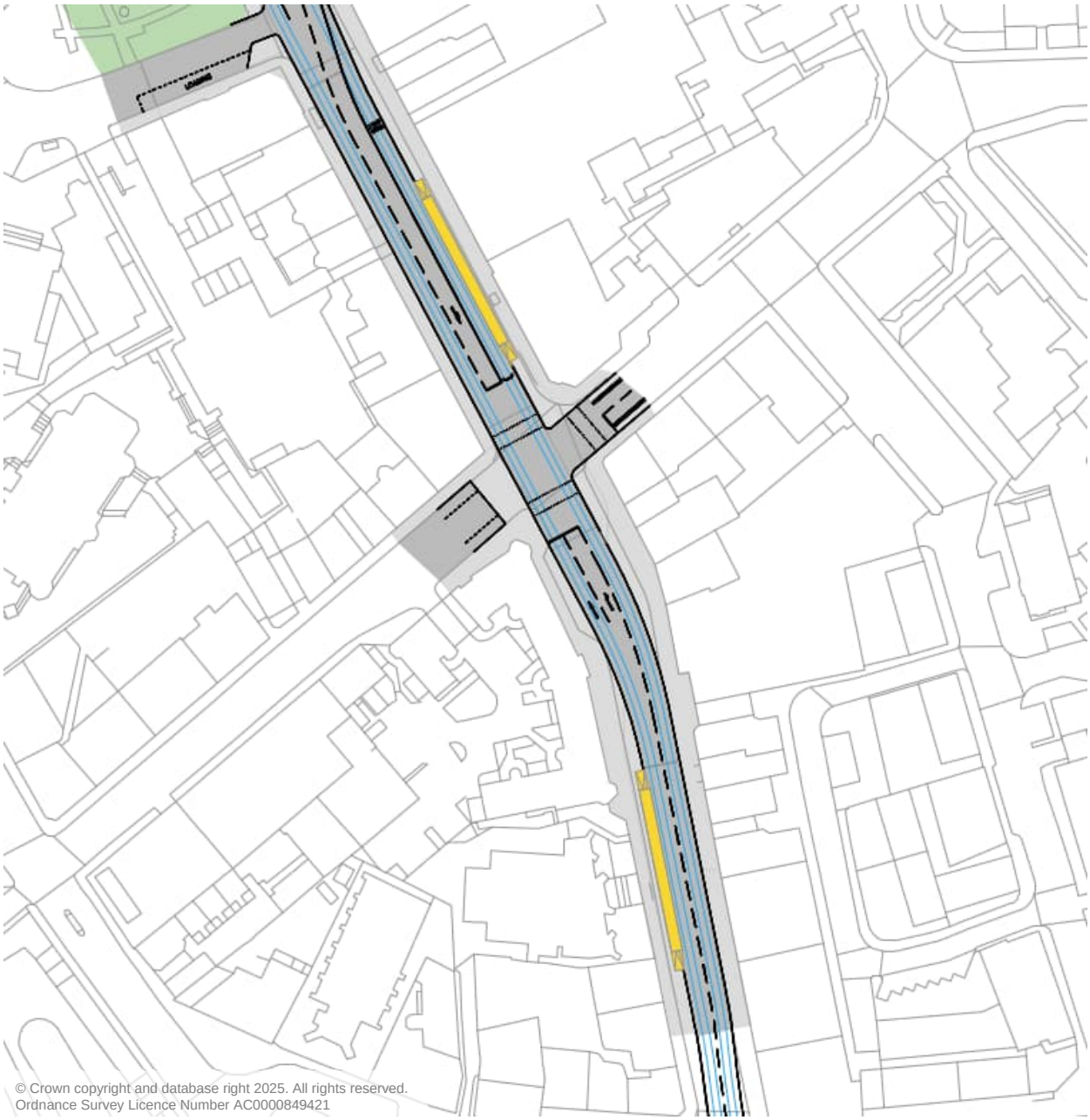
Figure 4.4 illustrates an example cross-section on South Bridge, north of Chambers Street. Three metre footways are provided, with two shared traffic / tram lanes and a southbound bus stop on the east side.

Figure 4.4: Cross-Section at South Bridge Looking North



The gap between a tram-stop platform and the nearside track rail is too narrow to allow a cyclist to safely pass. To avoid the need for cyclists to cross the rail, tram stops at Nicholson Street and Newington Road have been designed to allow cyclists to pass behind the platform. Platforms are offset to provide sufficient space; the Nicholson Square layout is shown in Figure 4.5.

Figure 4.5: Example Tram Stop Layout, Nicolson Street



Between Minto Street / Salisbury Place and Craigmillar Park / Lady Road, a single shared traffic and tram lane would be provided in each direction, together with right turn filter lanes as required. All buses and loading would be in bays, minimising potential delays to tram.

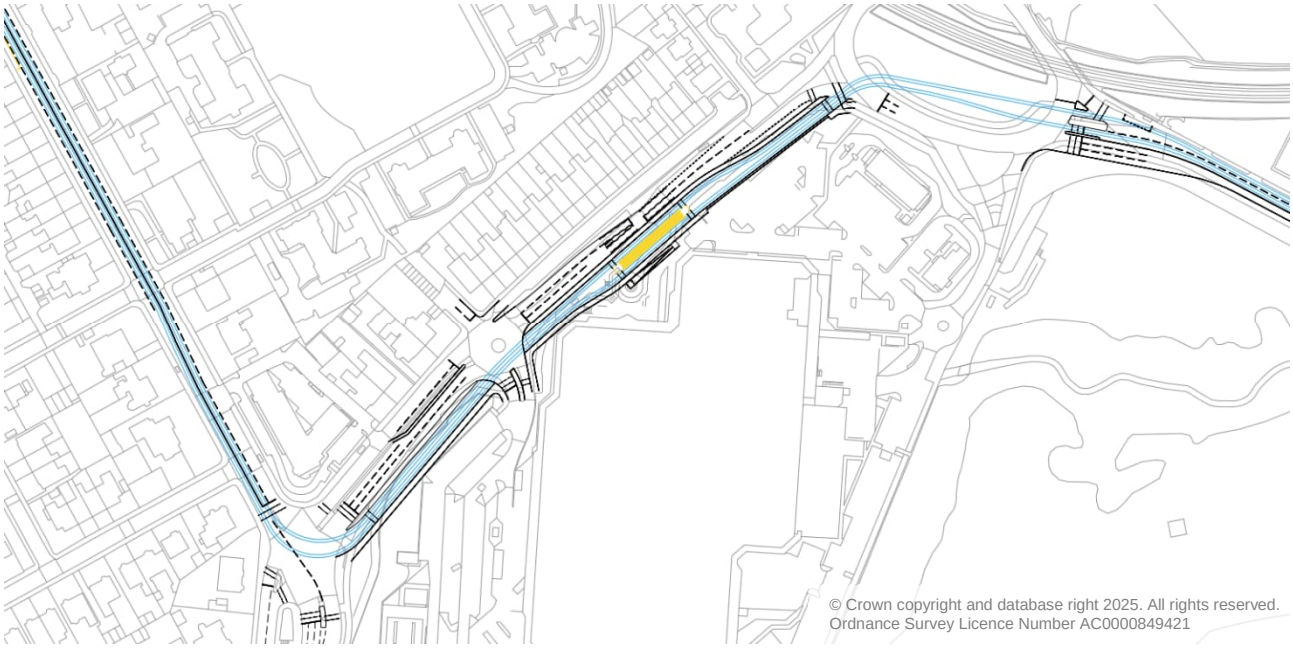
The majority of properties on this section of the route have private driveways. An overarching assumption within the design of the on-street section of the route is that uncontrolled right turn movements across tram tracks are minimised where possible. In addition, a central median will be required to accommodate OLE, potentially necessitating left in / left out access. Providing safe access to each property will therefore require careful consideration, including the use of alternative routes and possible U-turn provision at key junctions.

Liberton Road / Craigmillar Park / Lady Road, Cameron Toll Car Park Access and Cameron Toll are a complex series of junctions, as highlighted in Figure 4.6.

The tight turn between Craigmillar Park and Lady Road means that trams will traverse the junction slowly (10kph), reducing the available capacity for buses and general traffic. To deliver even 70% of current traffic capacity, a complicated junction layout is required with multiple traffic lanes. On Lady Road, east of Craigmillar Park, two tram tracks and five general traffic lanes are necessary, limiting opportunities for placemaking and streetscape improvements. It may be possible to reduce the number of lanes required, but modelling indicates that this will result in unacceptable levels of congestion.

A route adjacent to the Cameron Toll shopping centre was previously agreed with the site owner. Due to the subsequent construction of a fast-food restaurant, the route has been amended to pass through the centre of Cameron Toll roundabout rather than to the south. Otherwise, delivery of tram through this junction is simpler than at Liberton Road / Craigmillar Park / Lady Road.

Figure 4.6: Lady Road at Cameron Toll



Beyond Cameron Toll, the route is largely on-street along Old Dalkeith Road, mitigating potential impacts at Bridgend Farm, and wider tree loss along the route. The Candidate Design takes cognisance of active travel proposals along the corridor. However, it has been agreed that the materials used in that scheme should reflect the fact it will likely be more cost effective to rebuild cycle provision as part of the construction of tram at a point in the future.

Little France Drive includes a segregated corridor for tram. The route then turns right to run adjacent to Tobias Street and then right again to follow the A6106 and Harelaw to Shawfair. These sections are also assumed to be largely off-street although the detail of this section of the alignment will be agreed with Midlothian Council at a future stage.

4.4 Network Performance

Microsimulation model runs have been assigned with 70% of baseline traffic, consistent with earlier City Centre Transformation assumptions. The deduction reflects:

- the reduced capacity of the road network
- mode switch from car to public transport, and
- the Council's target to reduce vehicle kilometres

Figures 4.7 to 4.12 illustrate modelled traffic volumes and queuing at 08:30. The junction that results in greatest congestion is Liberton Road / Craigmillar Park / Lady Road. This acts as a constraint to northbound movements towards the city centre form the south.

Figure 4.7 shows the benefit of a modal filter at North Bridge, with no significant delays to tram and buses as a result. Note that the proposed Bank Street modal filter (to be implemented as part of Meadows to George Street) has been omitted, reflecting the fact the model excludes Lothian Road and the potential for the westbound displacement of traffic.

Eastbound displacement is illustrated in Figure 4.8 with increased traffic on St Leonard's Street and Bernard Terrace towards South Clerk Street and Melville Drive.

Tram journey time reliability on the A701 Newington Road / Minto Street / Mayfield Gardens / Craigmillar Park corridor are sensitive to the performance of the parallel Dalkeith Road corridor. Localised queuing on the A701 (Figure 4.9) impacts on tram reliability, particularly at East / West Mayfield and Salisbury Road / Place junctions.

Figure 4.10 illustrates Cameron Toll / Lady Road corridor, including the Liberton Road / Craigmillar Park / Lady Road junction. Even at 70% of Do-Minimum demand, significant queuing occurs at this junction. With higher traffic levels, queues quickly extend in all directions. To minimise the impact on tram journey times, it becomes necessary to prioritise Craigmillar Park and Lady Road, further impacting Liberton Road and Esslemont Road queues.

The closure of Esslemont Road has been considered. This would simplify the number of junction stages, improving overall performance. It would also support improved walking, wheeling and cycling connectivity between the tram corridor and King's Buildings. Nevertheless, Esslemont Road is a bus route, and the closure would add significant cost and delay to Service 38. Implementing a modal filter to enable bus provision is of no benefit as traffic signals would still need to incorporate an Esslemont Road stage.

Tram runs through the centre of Cameron Toll roundabout and so can largely operate with traffic, limiting any impact. But there is a complex interaction between all three junctions Craigmillar Park / Cameron Toll Shopping Centre Access / Cameron Toll which requires careful coordination to minimise delays to tram, bus and general traffic. Taken together, these are the limiting factor in being able to run the VISSIM model with higher levels of traffic demand.

Tram is on-street on Old Dalkeith Road. At 70% of Do-Minimum demand, the corridor operates satisfactorily. Above 85% of existing demand, it becomes necessary to limit general traffic capacity at peak times. The most likely location for this is at the Old Dalkeith Road / Ferniehill Road junction.

In summary, a tram can be delivered on the South East corridor, although it will require a range of policy-on measures to ensure success. Tram will encourage mode shift away from car, and the design and resulting capacity constraints will further encourage reduced car travel. Nevertheless, it will be necessary to limit general traffic capacity on the approach to the route, at Liberton Road and the Old Dalkeith Road / Ferniehill Road junction to ensure a reliable tram service.

A Queue Management System, similar to that at Barnton, could help restrict general traffic while providing increased priority for public transport travelling into the city from the south.

Figure 4.7: With-Tram, Princes Street to Nicholson Square

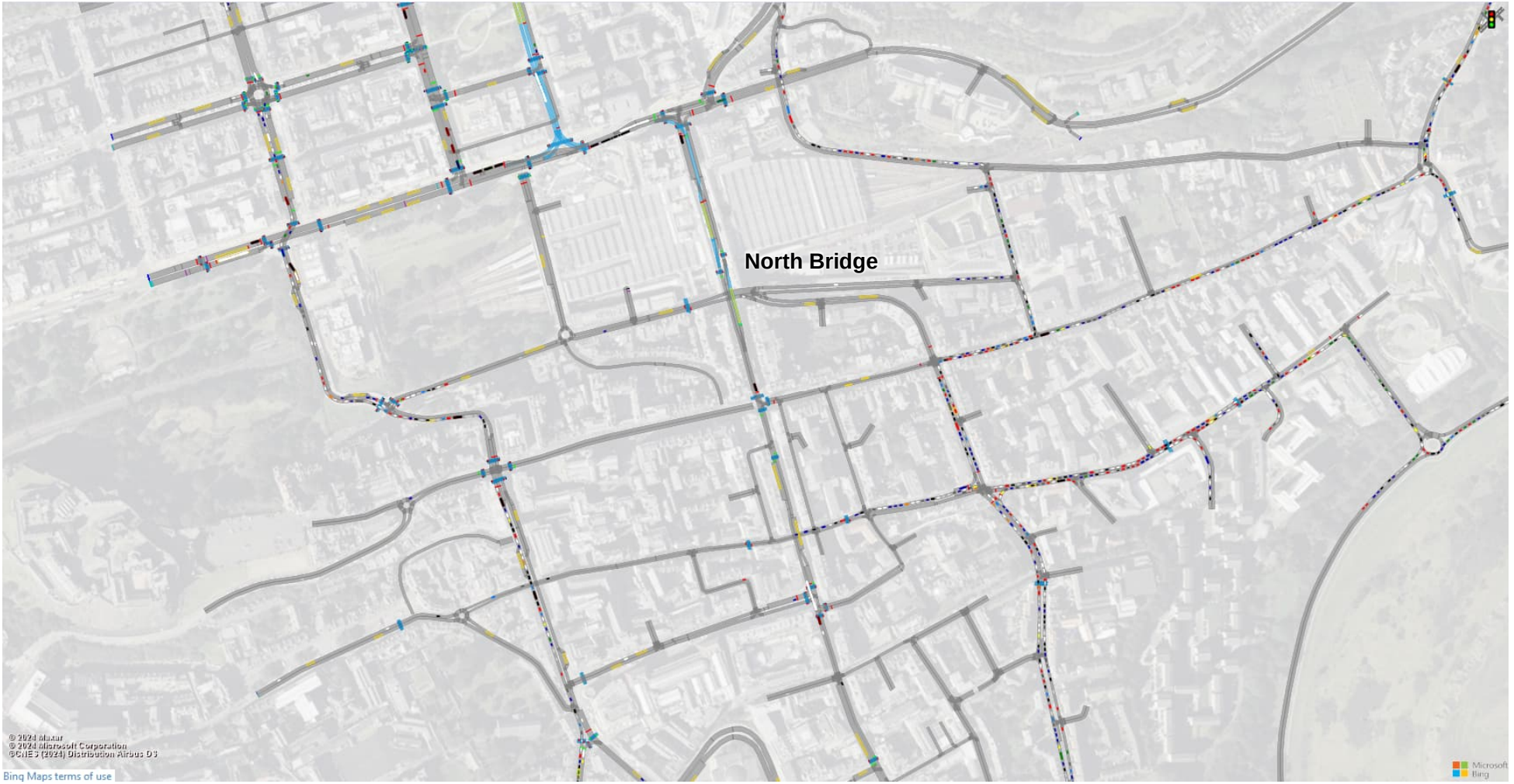


Figure 4.8: Nicholson Square to East Preston Street

Figure 4.9: East Preston Street to Craigmillar Park

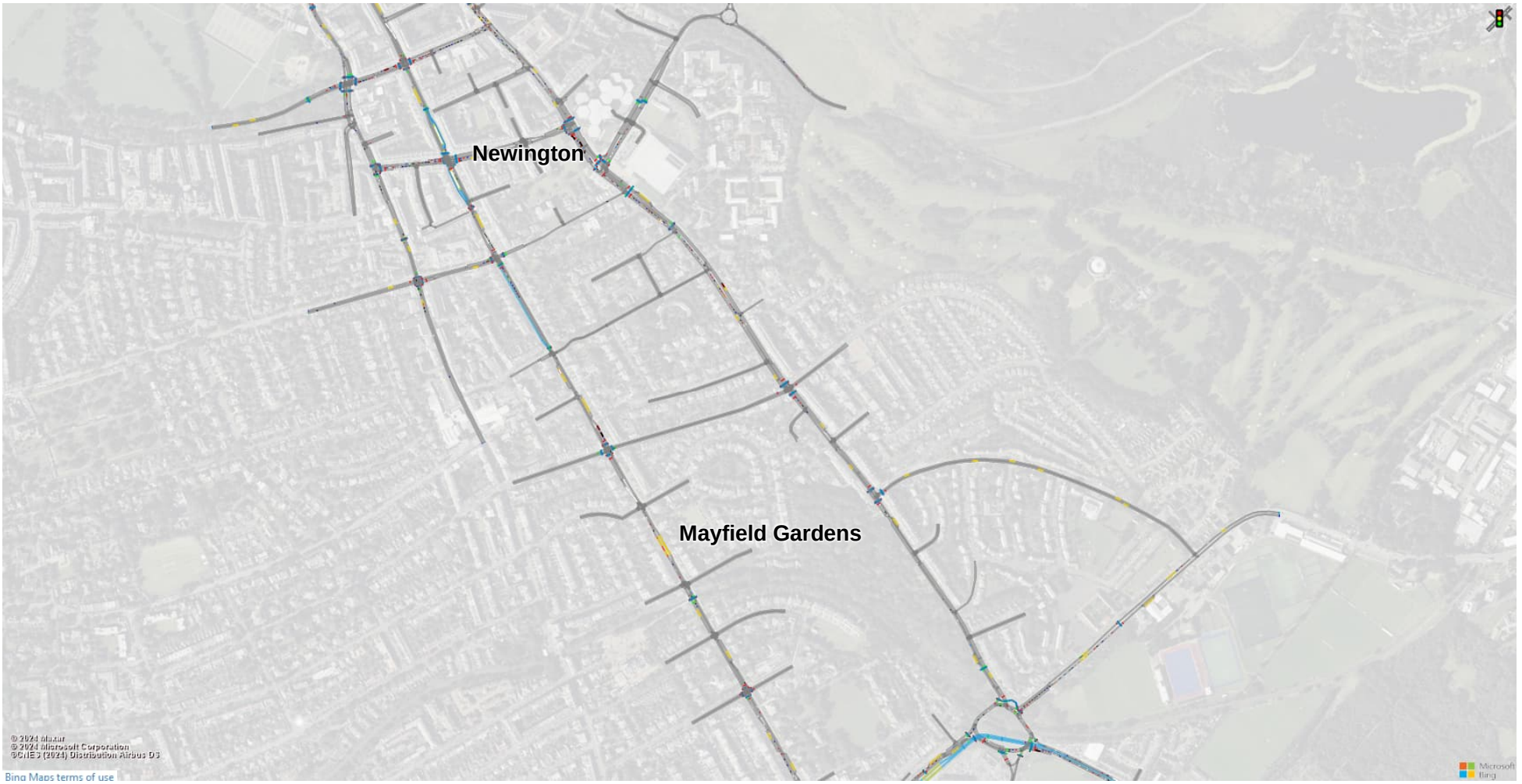


Figure 4.10: Craigmillar Park to Old Dalkeith Road (Cameron Toll)

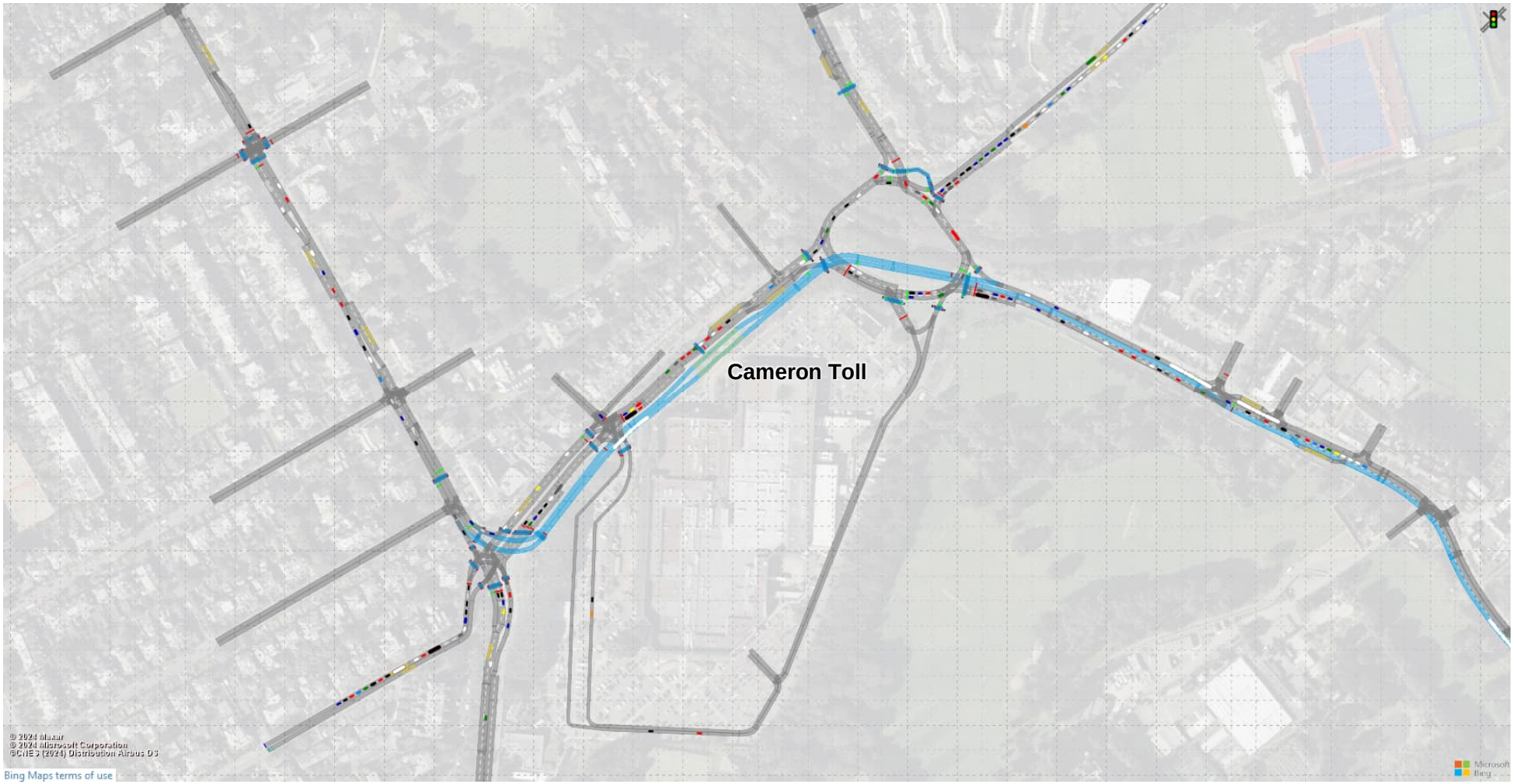


Figure 4.11: Old Dalkeith Road to Royal Infirmary, Edinburgh

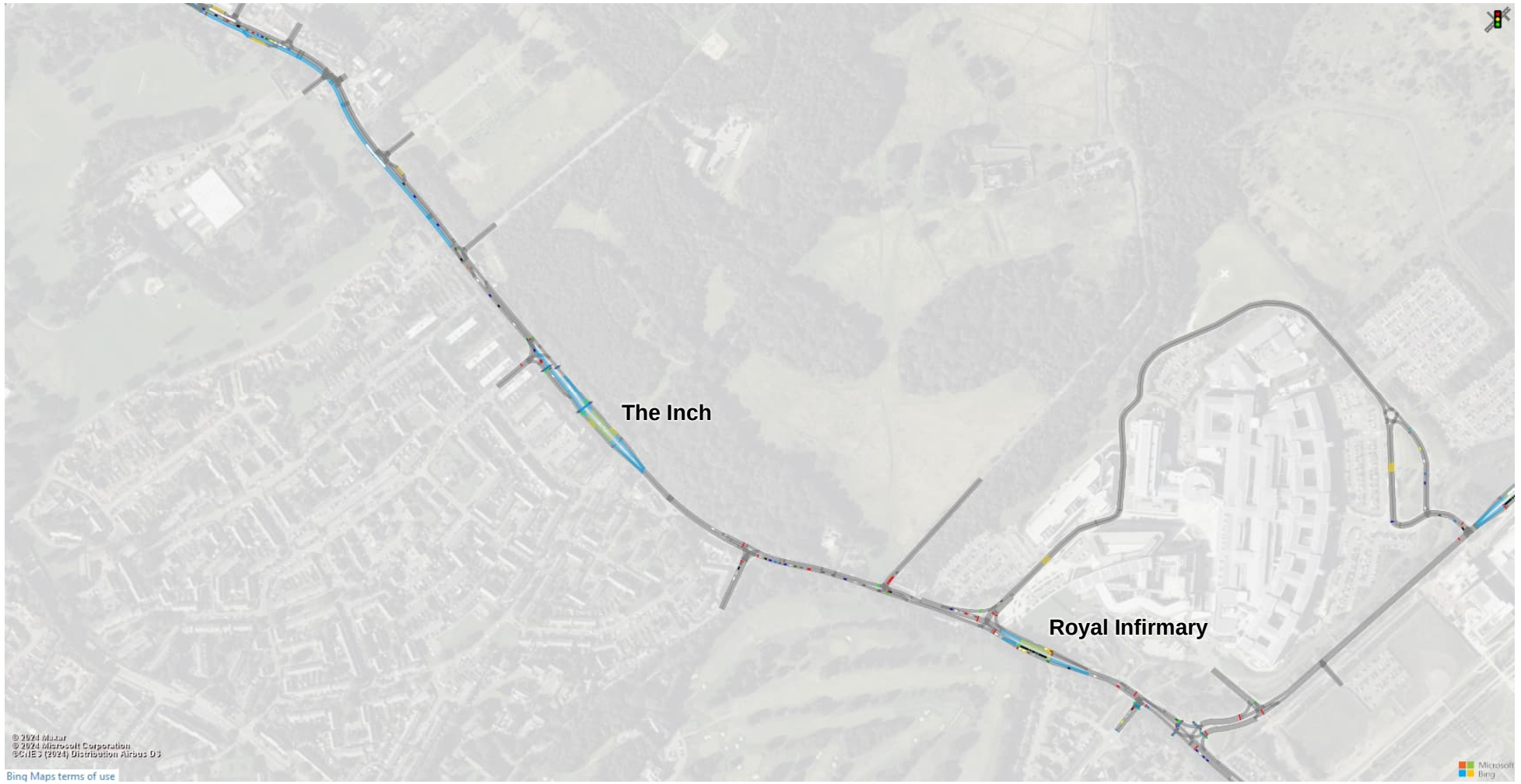


Figure 4.12: Royal Infirmary, Edinburgh to Shawfair

4.5 Corridor Tram Journey Times

Table 4.2 summarises average tram journey times between Shawfair and Princes Street.

Table 4.2: Tram Journey Times – Shawfair to Princes Street

	AM Peak		Interpeak	
	Average	Maximum	Average	Maximum
Shawfair to Princes Street	38 mins	45 mins	34 mins	34 mins
Princes Street to Shawfair	34 mins	34 mins	34 mins	34 mins

The citybound morning peak journey time between Shawfair and Princes Street is approximately 38 minutes; the reverse direction takes approximately 34 minutes.

Interpeak journey times are also around 34 minutes in both directions, which implies that morning peak journeys are delayed by approximately 4 minutes due to congestion.

It should be noted that the above values are average journey times and on one model run, a citybound tram was delayed by nearly 7 minutes over the full route. This variation reflects the complexity of running trams with traffic on the corridor. Additional interventions, including extra modal filters, and wider policy interventions to reduce general traffic could help improve journey time reliability.

It is also important to recognise that modelling is based on an early Candidate Design and that journey times may be improved as part of future detailed design development.

5. Summary and Conclusion

5.1 Summary Tram Journey Times

Three microsimulation have been developed to support the development of the Trams to Granton Candidate Design:

- Orchard Brae
- Roseburn, and
- South East

These have been used to identify key network constraints and to inform potential junction strategies, stop locations and wider placemaking opportunities for the Trams to Granton, BioQuarter and Beyond SBC. Design development has then helped inform tram journey times for each route. These journey times have subsequently been incorporated into the strategic modelling for the project, informing forecast tram patronage and supporting the wider SBC.

5.1.1 Orchard Brae v Roseburn Tram Journey Times

A key focus of the SBC will be the appraisal for whether the tram route between Granton and the city centre should be via Orchard Brae or Roseburn. A complete multi-criteria assessment is being undertaken as part of the full SBC report, including environmental impacts, heritage, costs, acceptability, etc. The microsimulation models can assist with evaluating some deliverability elements but the primary output from the models are tram journey times and ultimately how these impact tram patronage and revenue.

Table 5.1 summarises the modelled tram journey times via Orchard Brae and Roseburn for the AM and IP. It includes the average travel times and the maximum journey times.

Table 5.1: Orchard Brae v Roseburn Tram Journey Times

	Via Roseburn	Via Orchard Brae	Additional Journey Time Via Orchard Brae	
	Mins	Mins	Mins	Percentage
AM Granton to Princes Street (ave)	26	34	**+8**	+31%
AM Princes Street to Granton (ave)	25	32	**+7**	+28%
IP Granton to Princes Street (ave)	25	27	+2	+8%
IP Princes Street to Granton (ave)	25	27	+2	+8%
AM Granton to Princes Street (max)	27	37	**+10**	+37%
AM Princes Street to Granton (max)	26	33	**+7**	+27%
IP Granton to Princes Street (max)	27	28	+1	+4%
IP Princes Street to Granton (max)	26	30	+4	+15%

Tram journey times via Roseburn are faster than Orchard Brae for all model runs. This is primarily due to Roseburn being off-street while Orchard Brae is regularly delayed travelling in with general traffic. Even with reduced traffic demand assumptions, tram via Orchard Brae encounters significant queues that it cannot bypass due to width constraints on street. This is highlighted With-Tram journey times around 30% slower via Orchard Brae in the AM when traffic volumes are greater compared to 4%-15% in the IP when traffic volumes are lower.

Priority is given to tram at signalised junctions but it is difficult to deliver a green wave for tram through junctions, as occurs elsewhere on Edinburgh's tram network. This is due to traffic pressures and increased complexity of junction arrangements on the Orchard Brae route.

Tram travelling in with traffic also creates reliability issues. This is apparent in the maximum journey times modelled that are notably greater via Orchard Brae than Roseburn. This would lead to timetabling difficulties for the operator and frustration for users.

In addition to faster connectivity with the city centre, Roseburn also offers faster interchange opportunities at Haymarket with train, tram / bus to the airport and employment in the area. The Roseburn route stops at

Haymarket on the way to the city centre, whereas the Orchard Brae route would require interchange at Princes Street before travelling west to Haymarket.

5.1.2 Total Route Tram Journey Times

The total tram travel time between Granton and Shawfair is shown in Table 5.2. The table includes journey times via Roseburn and Orchard Brae in the AM and IP with average and maximum modelled times provided.

During the morning peak, via Roseburn is typically 7-8 minutes faster than Orchard Brae on average and 7-10 minutes when maximum travel times are compared. The differential between the two routes is less severe in the IP with only around 2 minutes additional travel time modelled. The exception to this in the IP maximum journey time via Orchard Brae which is over 4 minutes longer.

The greatest reliability concern for the Shawfair section of the route is travelling towards in the city centre in the AM where the maximum modelled journey time is over 7 minutes longer than the average.

Table 5.2: Total Tram Journey Times – Granton to Shawfair

	AM Peak			IP Peak		
via Roseburn	**Roseburn**	**South East**	**Total**	**Roseburn**	**South East**	**Total**
Granton to Shawfair (ave)	26 mins	34 mins	1 hr	25 mins	34 mins	59 mins
Shawfair to Granton (ave)	25 mins	38 mins	1 hr 4 mins	25 mins	34 mins	59 mins
Granton to Shawfair (max)	27 mins	34 mins	1 hr 1 min	27 mins	34 mins	1 hr 1 min
Shawfair to Granton (max)	26 mins	45 mins	1 hr 11 mins	26 mins	34 mins	1 hr
via Orchard Brae	**Orchard Brae**	**South East**	**Total**	**Orchard Brae**	**South East**	**Total**
Granton to Shawfair (ave)	34 mins	34 mins	1 hr 38 mins	27 mins	34 mins	1 hr 1 min
Shawfair to Granton (ave)	32 mins	38 mins	1 hr 11 mins	27 mins	34 mins	1 hr 1 min
Granton to Shawfair (max)	37 mins	34 mins	1 hr 11 mins	28 mins	34 mins	1 hr 2 mins
Shawfair to Granton (max)	33 mins	45 mins	1 hr 18 mins	30 mins	34 mins	1 hr 4 mins

5.2 Network Constraints / Points of Interest

This microsimulation exercise has helped highlight a number of network constraints on each route section. Potential solutions have been identified for some issues; others will be resolved during the next stage of the project (Outline Business Case) where they can be considered in greater detail.

Key constraints and points of interest are summarised in Table 5.3.

Note that Princes Street is a constraint in terms of the number of trams that can be operated reliably per hour. At this stage, we have assumed a maximum of 20 trams per hour per direction.

Table 5.3: Potential Network Constraints / Points of Interest

Orchard Brae	Roseburn	South East
Alignment at Crewe Toll to be determined	Constraints relate to landscape, environment and ecology	Princes Street / South St Andrew Street Delta Junction potentially constraints tram capacity
Uncontrolled right turns across tram tracks to be avoided. Access to residential properties on west side of Crewe Road South to be determined	Largely off-street route results in faster and more reliable journey times	North Bridge cross-section impacts ability to provide segregated cycling
Comely Bank Roundabout to be replaced with signal controlled junction	Single tracking of Roseburn to Craigleith section enables tram and active travel provision can be accommodated within the existing track formation.	South Bridge corridor reduced to 2 or 3 traffic lanes to improve pedestrian environment. Complex signal design required to optimise tram journey times
Potential geometric constraints (curve and gradient) at Queensferry Road / Orchard Brae junction may require land take outside the existing carriageway boundary.	Tram crossing at Ferry Road / West Granton Access is the only major crossing on the corridor	Uncontrolled right turns across tram tracks to be avoided. Access to residential properties on Minto Street / Mayfield Gardens / Craigmillar Park to be determined
Only an east facing junction can be delivered between Queensferry Street and Princes Street. Interchange with stops towards the airport would be at Princes Street.	Route better serves Haymarket Station and office developments in the West End	Craigmillar Park / Liberton Road / Lady Road / Esslemont Road is a major traffic junction with conflicting N-S and E-W traffic movements. With-Tram junction design complex and still results in significant queuing with 70% of Do-Minimum traffic
Queensferry Street requires the relocation of busy bus stops to other locations. Limited bus stop capacity potentially restricts future bus passenger growth on the corridor.	Interchange is at Haymarket rather than Princes Street, reducing journey times between the corridor and all stops towards the airport	Tram is part of a package of interventions to reduce veh-kms. Nevertheless, 'up-stream' capacity constraint may be required as part of wider package of interventions to encourage mode shift
It is not possible to provide adjacent cycling infrastructure between Crewe Toll and the city centre. No segregated cycling provision across Dean Bridge creates a potential safety issue. Similarly, no segregated cycling provision on Orchard Brae; targeted provision only on Crewe Road South	Active travel provision would be retained along the route. Additional cycling provision would be delivered prior to construction, maintaining connectivity. This will include new cycling infrastructure to the east on Queensferry Road, Dean bridge and to the west via Craigleith and Murrayfield.	Cycling would be delivered on parallel Buccleuch Street and Pleasance corridors. Scheme design takes cognisance of Lady Road / Old Dalkeith active travel proposals

5.3 Conclusion

Microsimulation modelling of a new tram route between Granton and the city centre has shown that a route via Roseburn is faster and more reliable than a route via Orchard Brae. This is due to the Roseburn route being largely off-street, with limited traffic interaction. By contrast, a route via Orchard Brae follows the busy Crewe Road South / Orchard Brae and Queensferry Road corridor to Queensferry Street, with multiple complex junctions along the corridor.

Tram via Roseburn has the potential to deliver a step change in public transport provision from the north of the city. Tram compliments existing and improved bus services on the Orchard Brae / Queensferry Road corridor while providing new connectivity to Haymarket and the West End. The route also provides improved interchange with stops westwards towards Edinburgh Park, The Gyle, West Town and the airport.

Conversely, a tram route via Orchard Brae creates potential conflicts between bus and tram. Both modes share the same corridor, but different stopping locations for each means that journey times are impacted, and with wider traffic congestion increased.

Routing tram via Orchard Brae creates a major capacity constraint at Queensferry Street. Available bus capacity is seriously impacted, the location of stops and the space provided for them is constrained, limiting the potential for future passenger growth on the Queensferry Road corridor.

Bus priority improvements on the A90 corridor have resulted in major passenger growth on Stagecoach services from Fife. New housing development in Queensferry has helped support improvements to Lothian Country's Service 43, while Lothian continue to expand their city network. In delivering tram on Queensferry Street, continued growth will be severely impacted unless new stop locations can be identified in the city centre.

A tram route to the south east would help deliver major streetscape and placemaking improvements along the South Bridge corridor. This is a densely populated urban environment with one of the highest levels of footfall in the city. Improvements would be focussed around improved pedestrian provision, with wider footways reducing congestion and addressing existing road safety issues around busy bus stops.

Tram would encourage major development at a higher density and faster build out rate at the BioQuarter compared with bus, while also reducing the need to travel by private vehicle. The route also provides enhanced public transport connectivity to the Royal Infirmary, Edinburgh, the University of Edinburgh and retail (and future development opportunities) at Cameron Toll.

Nevertheless, competitive and reliable tram journey times will be dependent on a reduction in traffic along the route. This may require additional restrictions at Liberton Road and Ferniehill Road, as part of a wider policy led package of interventions to encourage mode shift.

Appendix A. Orchard Brae Model Calibration

Table A.1: Orchard Brae Model Calibration AM 08:00-09:00

	Movement					Observed Count				VISSIM Model				Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
Princes Street / South Charlotte Street																					
Site 85	32	123	84	Princes Street E	South Charlotte Street	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 85	32	123	79	Princes Street E	Princes Street W	34	129	163	20	128	148	-14	-41%	-15	-9%	✓	✓	2.7	1.2	✓	✓
Site 85	32	69	79	South Charlotte Street	Princes Street W	633	42	675	623	26	649	-10	-2%	-26	-4%	✓	✓	0.4	1.0	✓	✓
Site 85	32	69	81	South Charlotte Street	Princes Street E	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 85	32	78	81	Princes Street W	Princes Street E	34	125	159	18	116	134	-16	-47%	-25	-16%	✓	✓	3.1	2.1	✓	✓
Site 85	32	78	84	Princes Street W	South Charlotte Street	569	33	602	559	19	578	-10	-2%	-24	-4%	✓	✓	0.4	1.0	✓	✓
Princes Street / Lothian Road																					
Site 38	33	79	82	Princes Street E	Lothian Road	500	67	567	627	73	700	127	25%	133	23%	×	×	5.4	5.3	×	×
Site 38	33	79	75	Princes Street E	Princes Street W	15	92	107	16	81	97	1	7%	-10	-9%	✓	✓	0.3	1.0	✓	✓
Site 38	33	92	75	Lothian Road	Princes Street W	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 38	33	92	78	Lothian Road	Princes Street E	525	62	587	558	53	611	33	6%	24	4%	✓	✓	1.4	1.0	✓	✓
Site 38	33	77	78	Princes Street W	Princes Street E	42	102	144	19	82	101	-23	-55%	-43	-30%	✓	✓	4.2	3.9	✓	✓
Site 38	33	77	82	Princes Street W	Lothian Road	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Princes Street/ Shandwick Pl/ Queensferry Street																					
Site 1	34	76	5	Princes Street E	Queensferry Street	5	24	29	8	26	34	3	60%	5	17%	✓	✓	1.2	0.9	✓	✓
Site 1	34	76	74	Princes Street E	Shandwick Place	16	65	81	8	55	63	-8	-50%	-18	-22%	✓	✓	2.3	2.1	✓	✓
Site 1	34	4	74	Queensferry Street	Shandwick Place	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 1	34	4	77	Queensferry Street	Princes Street E	8	26	34	4	26	30	-4	-50%	-4	-12%	✓	✓	1.6	0.7	✓	✓
Site 1	34	67	77	Shandwick Place	Princes Street E	44	67	111	15	55	70	-29	-66%	-41	-37%	✓	✓	5.3	4.3	×	✓
Site 1	34	67	5	Shandwick Place	Queensferry Street	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Melville Street																					
Site 79	1	5	3	Melville St Eastbound		171	11	182	106	6	112	-65	-38%	-70	-38%	✓	✓	5.5	5.8	×	×
Site 79	1	221	2	Melville St Westbound		147	5	152	129	1	130	-18	-12%	-22	-14%	✓	✓	1.5	1.9	✓	✓
Randolph Place / Randolph Crescent / Drumsheugh Place																					
Site 29	35	2	116	Randolph Place	Randolph Crescent	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 29	35	2	45	Randolph Place	Drumsheugh Place	159	41	200	171	38	209	12	8%	9	5%	✓	✓	0.9	0.6	✓	✓
Site 29	35	116	45	Randolph Crescent	Drumsheugh Place	278	14	292	268	8	276	-10	-4%	-16	-5%	✓	✓	0.6	0.9	✓	✓
Site 29	35	116	1	Randolph Crescent	Randolph Place	85	5	90	86	4	90	1	1%	0	0%	✓	✓	0.1	0.0	✓	✓
Site 29	35	1	1	Drumsheugh Place	Randolph Place	153	41	194	149	41	190	-4	-3%	-4	-2%	✓	✓	0.3	0.3	✓	✓
Site 29	35	1	116	Drumsheugh Place	Randolph Crescent	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Drumsheugh Gardens																					
Site 78	36	31	16	Drums'gh Gdns Wbnd		246	6	252	248	10	258	2	1%	6	2%	✓	✓	0.1	0.4	✓	✓
Site 78	36	45	32	Drums'gh Gdns Wbnd		238	5	243	216	9	225	-22	-9%	-18	-7%	✓	✓	1.5	1.2	✓	✓
Drumsheugh Place / Randolph Crescent / Lynedoch Place																					
Site 30	7	16	24	Drumsheugh Place	Randolph Crescent	257	9	266	250	9	259	-7	-3%	-7	-3%	✓	✓	0.4	0.4	✓	✓

	Movement					Observed Count			VISSIM Model			Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total
Site 30	7	16	15	Drumsheugh Place	Lynedoch Place	323	43	366	357	39	396	34	11%	30	8%	✓	✓	1.8	1.5	✓	✓
Site 30	7	24	15	Randolph Crescent	Lynedoch Place	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 30	7	24	13	Randolph Crescent	Drumsheugh Place	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 30	7	13	13	Lynedoch Place	Drumsheugh Place	279	43	322	288	42	330	9	3%	8	2%	✓	✓	0.5	0.4	✓	✓
Site 30	7	13	24	Lynedoch Place	Randolph Crescent	316	7	323	306	2	308	-10	-3%	-15	-5%	✓	✓	0.6	0.8	✓	✓
Site 30	7	16	24	Drumsheugh Place	Randolph Crescent	257	9	266	250	9	259	-7	-3%	-7	-3%	✓	✓	0.4	0.4	✓	✓
Queensferry Road/ Orchard Brae / Dean Path																			
Site 109	5	18	28	Queensferry Rd E	Dean Path	77	0	77	73	0	73	-4	-5%	-4	-5%	✓	✓	0.5	0.5	✓	✓
Site 109	5	18	14	Queensferry Rd E	Queensferry Rd W	232	27	259	210	25	235	-22	-9%	-24	-9%	✓	✓	1.5	1.5	✓	✓
Site 109	5	18	25	Queensferry Rd E	Orchard Brae	55	15	70	61	14	75	6	11%	5	7%	✓	✓	0.8	0.6	✓	✓
Site 109	5	27	14	Dean Path	Queensferry Rd W	23	7	30	20	0	20	-3	-13%	-10	-33%	✓	✓	0.6	2.0	✓	✓
Site 109	5	27	25	Dean Path	Orchard Brae	86	0	86	83	2	85	-3	-3%	-1	-1%	✓	✓	0.3	0.1	✓	✓
Site 109	5	27	12	Dean Path	Queensferry Rd E	55	1	56	56	0	56	1	2%	0	0%	✓	✓	0.1	0.0	✓	✓
Site 109	5	153	25	Queensferry Rd W	Orchard Brae	84	4	88	97	2	99	13	15%	11	13%	✓	✓	1.4	1.1	✓	✓
Site 109	5	153	12	Queensferry Rd W	Queensferry Rd E	374	31	405	329	24	353	-45	-12%	-52	-13%	✓	✓	2.4	2.7	✓	✓
Site 109	5	153	28	Queensferry Rd W	Dean Path	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 109	5	112	14	Orchard Brae	Queensferry Rd W	61	4	65	64	2	66	3	5%	1	2%	✓	✓	0.4	0.1	✓	✓
Site 109	5	112	28	Orchard Brae	Dean Path	122	2	124	110	1	111	-12	-10%	-13	-10%	✓	✓	1.1	1.2	✓	✓
Site 109	5	112	12	Orchard Brae	Queensferry Rd E	119	24	143	124	17	141	5	4%	-2	-1%	✓	✓	0.5	0.2	✓	✓
Comely Bank Road / Orchard Brae / Crewe Road South																			
Site 63	2	25	134	Orchard Brae	Orchard Road	4	0	4	6	1	7	2	50%	3	75%	✓	✓	0.9	1.3	✓	✓
Site 63	2	25	34	Orchard Brae	Craigleith Road	10	1	11	10	2	12	0	0%	1	9%	✓	✓	0.0	0.3	✓	✓
Site 63	2	25	38	Orchard Brae	Crewe Road South	144	13	157	155	14	169	11	8%	12	8%	✓	✓	0.9	0.9	✓	✓
Site 63	2	25	35	Orchard Brae	Comely Bank Road	53	3	56	54	1	55	1	2%	-1	-2%	✓	✓	0.1	0.1	✓	✓
Site 63	2	146	34	Orchard Road	Craigleith Road	9	0	9	7	0	7	-2	-22%	-2	-22%	✓	✓	0.7	0.7	✓	✓
Site 63	2	146	38	Orchard Road	Crewe Road South	110	2	112	98	4	102	-12	-11%	-10	-9%	✓	✓	1.2	1.0	✓	✓
Site 63	2	146	35	Orchard Road	Comely Bank Road	99	2	101	69	1	70	-30	-30%	-31	-31%	✓	✓	3.3	3.4	✓	✓
Site 63	2	146	110	Orchard Road	Orchard Brae	6	0	6	9	0	9	3	50%	3	50%	✓	✓	1.1	1.1	✓	✓
Site 63	2	108	38	Craigleith Road	Crewe Road South	73	2	75	62	8	70	-11	-15%	-5	-7%	✓	✓	1.3	0.6	✓	✓
Site 63	2	108	35	Craigleith Road	Comely Bank Road	261	7	268	281	5	286	20	8%	18	7%	✓	✓	1.2	1.1	✓	✓
Site 63	2	108	110	Craigleith Road	Orchard Brae	18	0	18	22	1	23	4	22%	5	28%	✓	✓	0.9	1.1	✓	✓
Site 63	2	108	134	Craigleith Road	Orchard Road	5	0	5	9	0	9	4	80%	4	80%	✓	✓	1.5	1.5	✓	✓
Site 63	2	212	35	Crewe Road South	Comely Bank Road	66	8	74	61	2	63	-5	-8%	-11	-15%	✓	✓	0.6	1.3	✓	✓
Site 63	2	212	110	Crewe Road South	Orchard Brae	236	25	261	211	19	230	-25	-11%	-31	-12%	✓	✓	1.7	2.0	✓	✓
Site 63	2	212	134	Crewe Road South	Orchard Road	64	0	64	59	0	59	-5	-8%	-5	-8%	✓	✓	0.6	0.6	✓	✓
Site 63	2	212	34	Crewe Road South	Craigleith Road	102	4	106	100	1	101	-2	-2%	-5	-5%	✓	✓	0.2	0.5	✓	✓
Site 63	2	230	110	Comely Bank Road	Orchard Brae	67	2	69	48	0	48	-19	-28%	-21	-30%	✓	✓	2.5	2.7	✓	✓
Site 63	2	230	134	Comely Bank Road	Orchard Road	76	1	77	50	0	50	-26	-34%	-27	-35%	✓	✓	3.3	3.4	✓	✓

	Movement					Observed Count			VISSIM Model			Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total
Site 63	2	230	34	Comely Bank Road	Craigleith Road	297	5	302	287	6	293	-10	-3%	-9	-3%	✓	✓	0.6	0.5	✓	✓
Site 63	2	230	38	Comely Bank Road	Crewe Road South	69	8	77	56	1	57	-13	-19%	-20	-26%	✓	✓	1.6	2.4	✓	✓
Crewe Toll - Crewe Road South / Ferry Road Telford Road																			
Site 64	8	56	55	Crewe Road South	Telford Road	75	4	79	77	0	77	2	3%	-2	-3%	✓	✓	0.2	0.2	✓	✓
Site 64	8	56	53	Crewe Road South	Ferry Road W	176	11	187	169	13	182	-7	-4%	-5	-3%	✓	✓	0.5	0.4	✓	✓
Site 64	8	56	50	Crewe Road South	Crewe Road North	114	14	128	107	1	108	-7	-6%	-20	-16%	✓	✓	0.7	1.8	✓	✓
Site 64	8	56	46	Crewe Road South	Ferry Road E	70	2	72	69	2	71	-1	-1%	-1	-1%	✓	✓	0.1	0.1	✓	✓
Site 64	8	99	53	Telford Road	Ferry Road W	90	5	95	94	1	95	4	4%	0	0%	✓	✓	0.4	0.0	✓	✓
Site 64	8	99	50	Telford Road	Crewe Road North	124	13	137	97	12	109	-27	-22%	-28	-20%	✓	✓	2.6	2.5	✓	✓
Site 64	8	99	46	Telford Road	Ferry Road E	393	24	417	366	24	390	-27	-7%	-27	-6%	✓	✓	1.4	1.3	✓	✓
Site 64	8	99	60	Telford Road	Crewe Road South	59	5	64	61	2	63	2	3%	-1	-2%	✓	✓	0.3	0.1	✓	✓
Site 64	8	23	50	Ferry Road W	Crewe Road North	50	2	52	50	3	53	0	0%	1	2%	✓	✓	0.0	0.1	✓	✓
Site 64	8	23	46	Ferry Road W	Ferry Road E	168	10	178	175	2	177	7	4%	-1	-1%	✓	✓	0.5	0.1	✓	✓
Site 64	8	23	60	Ferry Road W	Crewe Road South	219	13	232	214	13	227	-5	-2%	-5	-2%	✓	✓	0.3	0.3	✓	✓
Site 64	8	23	55	Ferry Road W	Telford Road	45	8	53	40	3	43	-5	-11%	-10	-19%	✓	✓	0.8	1.4	✓	✓
Site 64	8	61	46	Crewe Road North	Ferry Road E	69	0	69	58	3	61	-11	-16%	-8	-12%	✓	✓	1.4	1.0	✓	✓
Site 64	8	61	60	Crewe Road North	Crewe Road South	204	10	214	210	0	210	6	3%	-4	-2%	✓	✓	0.4	0.3	✓	✓
Site 64	8	61	55	Crewe Road North	Telford Road	169	7	176	139	6	145	-30	-18%	-31	-18%	✓	✓	2.4	2.4	✓	✓
Site 64	8	61	53	Crewe Road North	Ferry Road W	41	0	41	51	4	55	10	24%	14	34%	✓	✓	1.5	2.0	✓	✓
Site 64	8	48	60	Ferry Road E	Crewe Road South	76	1	77	74	0	74	-2	-3%	-3	-4%	✓	✓	0.2	0.3	✓	✓
Site 64	8	48	55	Ferry Road E	Telford Road	399	16	415	383	15	398	-16	-4%	-17	-4%	✓	✓	0.8	0.8	✓	✓
Site 64	8	48	53	Ferry Road E	Ferry Road W	206	11	217	210	8	218	4	2%	1	0%	✓	✓	0.3	0.1	✓	✓
Site 64	8	48	50	Ferry Road E	Crewe Road North	67	2	69	60	3	63	-7	-10%	-6	-9%	✓	✓	0.9	0.7	✓	✓
West Granton Road / West Granton Access																			
	69	10066	10071	West Granton Rd W	Waterfront Broadway	94	5	99	93	2	95	-1.05	-1%	-4	-4%	✓	✓	0.1	0.4	✓	✓
	69	10066	10072	West Granton Rd W	West Granton Rd E	371	20	390	319	12	331	-51.5	-14%	-59	-15%	✓	✓	2.8	3.1	✓	✓
	69	10066	10070	West Granton Rd W	West Granton Access	53	3	56	54	1	55	0.8	2%	-1	-2%	✓	✓	0.1	0.1	✓	✓
	69	10068	10072	Waterfront Broadway	West Granton Rd E	41	2	43	44	1	45	3.15	8%	2	5%	✓	✓	0.5	0.3	✓	✓
	69	10068	10070	Waterfront Broadway	West Granton Access	108	6	114	117	7	124	8.7	8%	10	9%	✓	✓	0.8	0.9	✓	✓
	69	10068	10069	Waterfront Broadway	West Granton Rd W	65	3	68	58	1	59	-6.6	-10%	-9	-13%	✓	✓	0.8	1.1	✓	✓
	69	10067	10070	West Granton Rd E	West Granton Access	218	11	229	206	6	212	-11.55	-5%	-17	-7%	✓	✓	0.8	1.1	✓	✓
	69	10067	10069	West Granton Rd E	West Granton Rd W	306	16	322	348	7	355	42.1	14%	33	10%	✓	✓	2.3	1.8	✓	✓
	69	10067	10071	West Granton Rd E	Waterfront Broadway	46	2	48	42	0	42	-3.6	-8%	-6	-13%	✓	✓	0.5	0.9	✓	✓
	69	10065	10069	West Granton Access	West Granton Rd W	62	3	65	61	2	63	-0.75	-1%	-2	-3%	✓	✓	0.1	0.3	✓	✓
	69	10065	10071	West Granton Access	Waterfront Broadway	155	8	163	162	10	172	7.15	5%	9	6%	✓	✓	0.6	0.7	✓	✓
	69	10065	10072	West Granton Access	West Granton Rd E	198	10	208	191	5	196	-6.6	-3%	-12	-6%	✓	✓	0.5	0.8	✓	✓
Waterfront Broadway / Morrisons																			
	75	10068	10068	Waterfront Broadway N	Waterfront Broadway S	144	8	152	166	9	175	21.6	15%	23	15%	✓	✓	1.7	1.8	✓	✓

	Movement					Observed Count			VISSIM Model			Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total
	75	10068	236	Waterfront Broadway N	Morrisons	18	1	19	20	2	22	1.95	11%	3	16%	✓	✓	0.4	0.7	✓	✓
	75	10074	236	Waterfront Broadway S	Morrisons	60	3	63	59	3	62	-0.85	-1%	-1	-2%	✓	✓	0.1	0.1	✓	✓
	75	10074	10074	Waterfront Broadway S	Waterfront Broadway N	215	11	226	238	9	247	23.3	11%	21	9%	✓	✓	1.5	1.4	✓	✓
	75	238	10074	Morrisons	Waterfront Broadway N	18	1	19	17	0	17	-1.05	-6%	-2	-11%	✓	✓	0.3	0.5	✓	✓
	75	238	10068	Morrisons	Waterfront Broadway S	45	2	47	51	0	51	6.35	14%	4	9%	✓	✓	0.9	0.6	✓	✓
Waterfront Avenue / Waterfront Park																			
	70	193	196	Waterfront Broadway N	Waterfront Avenue	5	0	5	7	0	7	2.25	47%	2	40%	✓	✓	0.9	0.8	✓	✓
	70	193	10304	Waterfront Broadway N	Waterfront Broadway S	12	1	13	13	1	14	0.65	5%	1	8%	✓	✓	0.2	0.3	✓	✓
	70	193	198	Waterfront Broadway N	Waterfront Park	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
	70	192	10304	Waterfront Avenue	Waterfront Broadway S	113	6	119	130	10	140	16.95	15%	21	18%	✓	✓	1.5	1.8	✓	✓
	70	192	198	Waterfront Avenue	Waterfront Park	21	1	22	18	2	20	-2.9	-14%	-2	-9%	✓	✓	0.7	0.4	✓	✓
	70	192	199	Waterfront Avenue	Waterfront Broadway N	6	0	6	6	0	6	0.3	5%	0	0%	✓	✓	0.1	0.0	✓	✓
	70	191	198	Waterfront Broadway S	Waterfront Park	17	1	18	18	1	19	0.9	5%	1	6%	✓	✓	0.2	0.2	✓	✓
	70	191	199	Waterfront Broadway S	Waterfront Broadway N	30	2	32	37	2	39	6.6	22%	7	22%	✓	✓	1.1	1.2	✓	✓
	70	191	196	Waterfront Broadway S	Waterfront Avenue	185	10	195	196	6	202	10.75	6%	7	4%	✓	✓	0.8	0.5	✓	✓
	70	194	199	Waterfront Park	Waterfront Broadway N	2	0	2	0	0	0	-1.9	-100%	-2	-100%	✓	✓	1.9	2.0	✓	✓
	70	194	196	Waterfront Park	Waterfront Avenue	48	3	50	43	4	47	-4.5	-9%	-3	-6%	✓	✓	0.7	0.4	✓	✓
	70	194	10304	Waterfront Park	Waterfront Broadway S	38	2	40	42	0	42	4	11%	2	5%	✓	✓	0.6	0.3	✓	✓
Waterfront Avenue / Saltire Street																			
	72	10388	10194	Saltire Street	Waterfront Avenue E	12	1	13	4	1	5	-8.35	-68%	-8	-62%	✓	✓	2.9	2.7	✓	✓
	72	10388	10329	Saltire Street	Waterfront Avenue W	7	0	7	5	0	5	-1.65	-25%	-2	-29%	✓	✓	0.7	0.8	✓	✓
	72	10329	10329	Waterfront Avenue E	Waterfront Avenue W	124	7	130	140	12	152	16.5	13%	22	17%	✓	✓	1.4	1.9	✓	✓
	72	10329	10227	Waterfront Avenue E	Saltire Street	3	0	3	2	0	2	-0.85	-30%	-1	-33%	✓	✓	0.5	0.6	✓	✓
	72	10194	10227	Waterfront Avenue W	Saltire Street	5	0	5	7	0	7	2.25	47%	2	40%	✓	✓	0.9	0.8	✓	✓
	72	10194	10194	Waterfront Avenue W	Waterfront Avenue E	215	11	226	236	10	246	21.3	10%	20	9%	✓	✓	1.4	1.3	✓	✓
Waterfront Avenue / West Harbour Road																			
	71	211	10214	West Harbour Rd W	Chestnut St	19	1	20	21	1	22	2	11%	2	10%	✓	✓	0.4	0.4	✓	✓
	71	211	10340	West Harbour Rd W	West Harbour Rd E	40	2	42	41	1	42	1.1	3%	0	0%	✓	✓	0.2	0.0	✓	✓
	71	211	10338	West Harbour Rd W	Waterfront Avenue	2	0	2	8	1	9	6.1	321%	7	350%	✓	✓	2.7	3.0	✓	✓
	71	208	10340	Chestnut St	West Harbour Rd E	16	1	17	19	6	25	2.85	18%	8	47%	✓	✓	0.7	1.7	✓	✓
	71	208	10338	Chestnut St	Waterfront Avenue	29	2	30	32	2	34	3.5	12%	4	13%	✓	✓	0.6	0.7	✓	✓
	71	208	10215	Chestnut St	West Harbour Rd W	2	0	2	1	0	1	-0.9	-47%	-1	-50%	✓	✓	0.7	0.8	✓	✓
	71	210	10338	West Harbour Rd E	Waterfront Avenue	66	3	69	85	9	94	19.45	30%	25	36%	✓	✓	2.2	2.8	✓	✓
	71	210	10215	West Harbour Rd E	West Harbour Rd W	34	2	36	42	0	42	7.8	23%	6	17%	✓	✓	1.3	1.0	✓	✓
	71	210	10214	West Harbour Rd E	Chestnut St	13	1	14	16	7	23	2.7	20%	9	64%	✓	✓	0.7	2.1	✓	✓
	71	206	10215	Waterfront Avenue	West Harbour Rd W	54	3	57	56	1	57	1.85	3%	0	0%	✓	✓	0.2	0.0	✓	✓
	71	206	10214	Waterfront Avenue	Chestnut St	49	3	52	44	1	45	-5.4	-11%	-7	-13%	✓	✓	0.8	1.0	✓	✓
	71	206	10340	Waterfront Avenue	West Harbour Rd E	125	7	132	135	9	144	9.6	8%	12	9%	✓	✓	0.8	1.0	✓	✓

	Movement					Observed Count				VISSIM Model				Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
																99%	99%			98%	99%
																133	133			131	132
																134	134			134	134

Table A.2: Orchard Brae Model Calibration PM 17:00-18:00

	Movement					Observed Count				VISSIM Model				Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
Princes Street / South Charlotte Street																					
Site 85	32	123	84	Princes Street E	South Charlotte Street	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 85	32	123	79	Princes Street E	Princes Street W	36	122	158	32	128	160	-4	-11%	2	1%	✓	✓	0.7	0.2	✓	✓
Site 85	32	69	79	South Charlotte Street	Princes Street W	611	14	625	645	11	656	34	6%	31	5%	✓	✓	1.4	1.2	✓	✓
Site 85	32	69	81	South Charlotte Street	Princes Street E	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 85	32	78	81	Princes Street W	Princes Street E	54	127	181	40	115	155	-14	-26%	-26	-14%	✓	✓	2.0	2.0	✓	✓
Site 85	32	78	84	Princes Street W	South Charlotte Street	579	9	588	545	12	557	-34	-6%	-31	-5%	✓	✓	1.4	1.3	✓	✓
Princes Street / Lothian Road																					
Site 38	33	79	82	Princes Street E	Lothian Road	504	54	558	656	58	714	152	30%	156	28%	×	×	6.3	6.2	×	×
Site 38	33	79	75	Princes Street E	Princes Street W	17	103	120	20	81	101	3	18%	-19	-16%	✓	✓	0.7	1.8	✓	✓
Site 38	33	92	75	Lothian Road	Princes Street W	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 38	33	92	78	Lothian Road	Princes Street E	501	52	553	545	46	591	44	9%	38	7%	✓	✓	1.9	1.6	✓	✓
Site 38	33	77	78	Princes Street W	Princes Street E	52	91	143	40	82	122	-12	-23%	-21	-15%	✓	✓	1.8	1.8	✓	✓
Site 38	33	77	82	Princes Street W	Lothian Road	1	0	1	0	0	0	-1	-100%	-1	-100%	✓	✓	1.4	1.4	✓	✓
Princes Street/ Shandwick Pl/ Queensferry Street																					
Site 1	34	76	5	Princes Street E	Queensferry Street	6	28	34	6	26	32	0	0%	-2	-6%	✓	✓	0.0	0.3	✓	✓
Site 1	34	76	74	Princes Street E	Shandwick Place	26	59	85	14	55	69	-12	-46%	-16	-19%	✓	✓	2.7	1.8	✓	✓
Site 1	34	4	74	Queensferry Street	Shandwick Place	1	0	1	0	0	0	-1	-100%	-1	-100%	✓	✓	1.4	1.4	✓	✓
Site 1	34	4	77	Queensferry Street	Princes Street E	5	27	32	5	26	31	0	0%	-1	-3%	✓	✓	0.0	0.2	✓	✓
Site 1	34	67	77	Shandwick Place	Princes Street E	66	59	125	36	55	91	-30	-45%	-34	-27%	✓	✓	4.2	3.3	✓	✓
Site 1	34	67	5	Shandwick Place	Queensferry Street	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Melville Street																					
Site 79	1	5	3	Melville St Eastbound		163	1	164	80	2	82	-83	-51%	-82	-50%	✓	✓	7.5	7.4	×	×
Site 79	1	221	2	Melville St Westbound		127	2	129	112	1	113	-15	-12%	-16	-12%	✓	✓	1.4	1.5	✓	✓
Randolph Place / Randolph Crescent / Drumsheugh Place																					
Site 29	35	2	116	Randolph Place	Randolph Crescent	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 29	35	2	45	Randolph Place	Drumsheugh Place	146	37	183	165	34	199	19	13%	16	9%	✓	✓	1.5	1.2	✓	✓
Site 29	35	116	45	Randolph Crescent	Drumsheugh Place	315	4	319	312	1	313	-3	-1%	-6	-2%	✓	✓	0.2	0.3	✓	✓
Site 29	35	116	1	Randolph Crescent	Randolph Place	78	1	79	81	2	83	3	4%	4	5%	✓	✓	0.3	0.4	✓	✓
Site 29	35	1	1	Drumsheugh Place	Randolph Place	109	36	145	105	34	139	-4	-4%	-6	-4%	✓	✓	0.4	0.5	✓	✓
Site 29	35	1	116	Drumsheugh Place	Randolph Crescent	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Drumsheugh Gardens																					
Site 78	36	31	16	Drums'gh Gdns Wbnd		258	1	259	223	4	227	-35	-14%	-32	-12%	✓	✓	2.3	2.1	✓	✓
Site 78	36	45	32	Drums'gh Gdns Wbnd		181	1	182	258	1	259	77	43%	77	42%	✓	✓	5.2	5.2	×	×
Drumsheugh Place / Randolph Crescent / Lynedoch Place																					
Site 30	7	16	24	Drumsheugh Place	Randolph Crescent	206	1	207	185	0	185	-21	-10%	-22	-11%	✓	✓	1.5	1.6	✓	✓
Site 30	7	16	15	Drumsheugh Place	Lynedoch Place	389	37	426	421	35	456	32	8%	30	7%	✓	✓	1.6	1.4	✓	✓

	Movement					Observed Count			VISSIM Model			Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total
Site 30	7	24	15	Randolph Crescent	Lynedoch Place	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 30	7	24	13	Randolph Crescent	Drumsheugh Place	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 30	7	13	13	Lynedoch Place	Drumsheugh Place	253	35	288	270	31	301	17	7%	13	5%	✓	✓	1.1	0.8	✓	✓
Site 30	7	13	24	Lynedoch Place	Randolph Crescent	214	7	221	242	2	244	28	13%	23	10%	✓	✓	1.9	1.5	✓	✓
Queensferry Road/ Orchard Brae / Dean Path																			
Site 109	5	18	28	Queensferry Rd E	Dean Path	45	0	45	39	0	39	-6	-13%	-6	-13%	✓	✓	0.9	0.9	✓	✓
Site 109	5	18	14	Queensferry Rd E	Queensferry Rd W	276	20	296	265	18	283	-11	-4%	-13	-4%	✓	✓	0.7	0.8	✓	✓
Site 109	5	18	25	Queensferry Rd E	Orchard Brae	52	12	64	64	15	79	12	23%	15	23%	✓	✓	1.6	1.8	✓	✓
Site 109	5	27	14	Dean Path	Queensferry Rd W	12	0	12	13	0	13	1	8%	1	8%	✓	✓	0.3	0.3	✓	✓
Site 109	5	27	25	Dean Path	Orchard Brae	92	0	92	99	0	99	7	8%	7	8%	✓	✓	0.7	0.7	✓	✓
Site 109	5	27	12	Dean Path	Queensferry Rd E	49	0	49	47	0	47	-2	-4%	-2	-4%	✓	✓	0.3	0.3	✓	✓
Site 109	5	153	25	Queensferry Rd W	Orchard Brae	103	0	103	114	1	115	11	11%	12	12%	✓	✓	1.1	1.1	✓	✓
Site 109	5	153	12	Queensferry Rd W	Queensferry Rd E	320	27	347	289	20	309	-31	-10%	-38	-11%	✓	✓	1.8	2.1	✓	✓
Site 109	5	153	28	Queensferry Rd W	Dean Path	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 109	5	112	14	Orchard Brae	Queensferry Rd W	101	4	105	88	0	88	-13	-13%	-17	-16%	✓	✓	1.3	1.7	✓	✓
Site 109	5	112	28	Orchard Brae	Dean Path	146	0	146	120	0	120	-26	-18%	-26	-18%	✓	✓	2.3	2.3	✓	✓
Site 109	5	112	12	Orchard Brae	Queensferry Rd E	94	14	108	100	11	111	6	6%	3	3%	✓	✓	0.6	0.3	✓	✓
Comely Bank Road / Orchard Brae / Crewe Road South																			
Site 63	2	25	134	Orchard Brae	Orchard Road	4	0	4	7	0	7	3	75%	3	75%	✓	✓	1.3	1.3	✓	✓
Site 63	2	25	34	Orchard Brae	Craigleith Road	12	0	12	19	0	19	7	58%	7	58%	✓	✓	1.8	1.8	✓	✓
Site 63	2	25	38	Orchard Brae	Crewe Road South	164	13	177	166	16	182	2	1%	5	3%	✓	✓	0.2	0.4	✓	✓
Site 63	2	25	35	Orchard Brae	Comely Bank Road	63	0	63	61	0	61	-2	-3%	-2	-3%	✓	✓	0.3	0.3	✓	✓
Site 63	2	146	34	Orchard Road	Craigleith Road	3	0	3	3	0	3	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Site 63	2	146	38	Orchard Road	Crewe Road South	105	0	105	102	0	102	-3	-3%	-3	-3%	✓	✓	0.3	0.3	✓	✓
Site 63	2	146	35	Orchard Road	Comely Bank Road	83	0	83	66	0	66	-17	-20%	-17	-20%	✓	✓	2.0	2.0	✓	✓
Site 63	2	146	110	Orchard Road	Orchard Brae	0	0	0	15	0	15	15	0%	15	0%	✓	✓	5.5	5.5	×	×
Site 63	2	108	38	Craigleith Road	Crewe Road South	69	4	73	73	2	75	4	6%	2	3%	✓	✓	0.5	0.2	✓	✓
Site 63	2	108	35	Craigleith Road	Comely Bank Road	260	1	261	279	1	280	19	7%	19	7%	✓	✓	1.2	1.2	✓	✓
Site 63	2	108	110	Craigleith Road	Orchard Brae	4	0	4	8	0	8	4	100%	4	100%	✓	✓	1.6	1.6	✓	✓
Site 63	2	108	134	Craigleith Road	Orchard Road	5	0	5	8	0	8	3	60%	3	60%	✓	✓	1.2	1.2	✓	✓
Site 63	2	212	35	Crewe Road South	Comely Bank Road	70	5	75	62	0	62	-8	-11%	-13	-17%	✓	✓	1.0	1.6	✓	✓
Site 63	2	212	110	Crewe Road South	Orchard Brae	238	12	250	206	13	219	-32	-13%	-31	-12%	✓	✓	2.1	2.0	✓	✓
Site 63	2	212	134	Crewe Road South	Orchard Road	96	0	96	86	0	86	-10	-10%	-10	-10%	✓	✓	1.0	1.0	✓	✓
Site 63	2	212	34	Crewe Road South	Craigleith Road	133	2	135	126	0	126	-7	-5%	-9	-7%	✓	✓	0.6	0.8	✓	✓
Site 63	2	230	110	Comely Bank Road	Orchard Brae	71	1	72	58	0	58	-13	-18%	-14	-19%	✓	✓	1.6	1.7	✓	✓
Site 63	2	230	134	Comely Bank Road	Orchard Road	62	0	62	46	0	46	-16	-26%	-16	-26%	✓	✓	2.2	2.2	✓	✓
Site 63	2	230	34	Comely Bank Road	Craigleith Road	249	1	250	241	3	244	-8	-3%	-6	-2%	✓	✓	0.5	0.4	✓	✓
Site 63	2	230	38	Comely Bank Road	Crewe Road South	73	5	78	68	1	69	-5	-7%	-9	-12%	✓	✓	0.6	1.0	✓	✓

	Movement					Observed Count				VISSIM Model				Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
Crewe Toll - Crewe Road South / Ferry Road Telford Road																					
Site 64	8	56	55	Crewe Road South	Telford Road	78	2	80	81	0	81	3	4%	1	1%	✓	✓	0.3	0.1	✓	✓
Site 64	8	56	53	Crewe Road South	Ferry Road W	177	11	188	172	12	184	-5	-3%	-4	-2%	✓	✓	0.4	0.3	✓	✓
Site 64	8	56	50	Crewe Road South	Crewe Road North	160	10	170	156	1	157	-4	-3%	-13	-8%	✓	✓	0.3	1.0	✓	✓
Site 64	8	56	46	Crewe Road South	Ferry Road E	84	0	84	79	0	79	-5	-6%	-5	-6%	✓	✓	0.6	0.6	✓	✓
Site 64	8	99	53	Telford Road	Ferry Road W	53	0	53	59	0	59	6	11%	6	11%	✓	✓	0.8	0.8	✓	✓
Site 64	8	99	50	Telford Road	Crewe Road North	177	2	179	181	1	182	4	2%	3	2%	✓	✓	0.3	0.2	✓	✓
Site 64	8	99	46	Telford Road	Ferry Road E	365	5	370	381	4	385	16	4%	15	4%	✓	✓	0.8	0.8	✓	✓
Site 64	8	99	60	Telford Road	Crewe Road South	43	2	45	42	0	42	-1	-2%	-3	-7%	✓	✓	0.2	0.5	✓	✓
Site 64	8	23	50	Ferry Road W	Crewe Road North	71	0	71	69	2	71	-2	-3%	0	0%	✓	✓	0.2	0.0	✓	✓
Site 64	8	23	46	Ferry Road W	Ferry Road E	179	7	186	188	1	189	9	5%	3	2%	✓	✓	0.7	0.2	✓	✓
Site 64	8	23	60	Ferry Road W	Crewe Road South	152	5	157	154	7	161	2	1%	4	3%	✓	✓	0.2	0.3	✓	✓
Site 64	8	23	55	Ferry Road W	Telford Road	80	1	81	79	0	79	-1	-1%	-2	-2%	✓	✓	0.1	0.2	✓	✓
Site 64	8	61	46	Crewe Road North	Ferry Road E	68	1	69	67	3	70	-1	-1%	1	1%	✓	✓	0.1	0.1	✓	✓
Site 64	8	61	60	Crewe Road North	Crewe Road South	153	10	163	141	0	141	-12	-8%	-22	-13%	✓	✓	1.0	1.8	✓	✓
Site 64	8	61	55	Crewe Road North	Telford Road	223	3	226	215	0	215	-8	-4%	-11	-5%	✓	✓	0.5	0.7	✓	✓
Site 64	8	61	53	Crewe Road North	Ferry Road W	42	0	42	55	0	55	13	31%	13	31%	✓	✓	1.9	1.9	✓	✓
Site 64	8	48	60	Ferry Road E	Crewe Road South	89	1	90	88	0	88	-1	-1%	-2	-2%	✓	✓	0.1	0.2	✓	✓
Site 64	8	48	55	Ferry Road E	Telford Road	431	0	431	426	5	431	-5	-1%	0	0%	✓	✓	0.2	0.0	✓	✓
Site 64	8	48	53	Ferry Road E	Ferry Road W	211	7	218	242	0	242	31	15%	24	11%	✓	✓	2.1	1.6	✓	✓
Site 64	8	48	50	Ferry Road E	Crewe Road North	92	0	92	92	4	96	0	0%	4	4%	✓	✓	0.0	0.4	✓	✓
West Granton Road / West Granton Access																					
	69	10066	10071	West Granton Rd W	Waterfront Broadway	62	3	65	67	0	67	5.25	9%	2	3%	✓	✓	0.7	0.2	✓	✓
	69	10066	10072	West Granton Rd W	West Granton Rd E	385	20	405	424	1	425	39.25	10%	20	5%	✓	✓	2.0	1.0	✓	✓
	69	10066	10070	West Granton Rd W	West Granton Access	37	2	39	36	0	36	-1.05	-3%	-3	-8%	✓	✓	0.2	0.5	✓	✓
	69	10068	10072	Waterfront Broadway	West Granton Rd E	74	4	78	77	0	77	2.9	4%	-1	-1%	✓	✓	0.3	0.1	✓	✓
	69	10068	10070	Waterfront Broadway	West Granton Access	157	8	165	165	3	168	8.25	5%	3	2%	✓	✓	0.7	0.2	✓	✓
	69	10068	10069	Waterfront Broadway	West Granton Rd W	103	5	108	96	0	96	-6.6	-6%	-12	-11%	✓	✓	0.7	1.2	✓	✓
	69	10067	10070	West Granton Rd E	West Granton Access	276	15	291	266	2	268	-10.45	-4%	-23	-8%	✓	✓	0.6	1.4	✓	✓
	69	10067	10069	West Granton Rd E	West Granton Rd W	368	19	387	379	0	379	11.35	3%	-8	-2%	✓	✓	0.6	0.4	✓	✓
	69	10067	10071	West Granton Rd E	Waterfront Broadway	60	3	63	59	0	59	-0.85	-1%	-4	-6%	✓	✓	0.1	0.5	✓	✓
	69	10065	10069	West Granton Access	West Granton Rd W	62	3	65	61	0	61	-0.75	-1%	-4	-6%	✓	✓	0.1	0.5	✓	✓
	69	10065	10071	West Granton Access	Waterfront Broadway	182	10	192	186	3	189	3.6	2%	-3	-2%	✓	✓	0.3	0.2	✓	✓
	69	10065	10072	West Granton Access	West Granton Rd E	185	10	195	171	3	174	-14.25	-8%	-21	-11%	✓	✓	1.1	1.5	✓	✓
Waterfront Broadway / Morrisons																					
	75	10068	10068	Waterfront Broadway N	Waterfront Broadway S	185	10	195	205	3	208	19.75	11%	13	7%	✓	✓	1.4	0.9	✓	✓
	75	10068	236	Waterfront Broadway N	Morrisons	46	2	48	45	0	45	-0.6	-1%	-3	-6%	✓	✓	0.1	0.4	✓	✓
	75	10074	236	Waterfront Broadway S	Morrisons	99	5	104	104	0	104	5.2	5%	0	0%	✓	✓	0.5	0.0	✓	✓

	Movement					Observed Count				VISSIM Model				Criteria 1 - Difference				Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	75	10074	10074	Waterfront Broadway S	Waterfront Broadway N	180	9	189	209	3	212	29.45	16%	23	12%	✓	✓	2.1	1.6	✓	✓
	75	238	10074	Morrisons	Waterfront Broadway N	36	2	38	39	0	39	2.9	8%	1	3%	✓	✓	0.5	0.2	✓	✓
	75	238	10068	Morrisons	Waterfront Broadway S	121	6	127	132	0	132	11.35	9%	5	4%	✓	✓	1.0	0.4	✓	✓
Waterfront Avenue / Waterfront Park																					
	70	193	196	Waterfront Broadway N	Waterfront Avenue	7	0	7	10	0	10	3.35	50%	3	43%	✓	✓	1.2	1.0	✓	✓
	70	193	10304	Waterfront Broadway N	Waterfront Broadway S	29	2	30	33	0	33	4.5	16%	3	10%	✓	✓	0.8	0.5	✓	✓
	70	193	198	Waterfront Broadway N	Waterfront Park	3	0	3	3	0	3	0.15	5%	0	0%	✓	✓	0.1	0.0	✓	✓
	70	192	10304	Waterfront Avenue	Waterfront Broadway S	141	7	148	150	3	153	9.4	7%	5	3%	✓	✓	0.8	0.4	✓	✓
	70	192	198	Waterfront Avenue	Waterfront Park	37	2	39	38	0	38	0.95	3%	-1	-3%	✓	✓	0.2	0.2	✓	✓
	70	192	199	Waterfront Avenue	Waterfront Broadway N	1	0	1	2	0	2	1.05	111%	1	100%	✓	✓	0.9	0.8	✓	✓
	70	191	198	Waterfront Broadway S	Waterfront Park	18	1	19	22	0	22	3.95	22%	3	16%	✓	✓	0.9	0.7	✓	✓
	70	191	199	Waterfront Broadway S	Waterfront Broadway N	11	1	12	15	0	15	3.6	32%	3	25%	✓	✓	1.0	0.8	✓	✓
	70	191	196	Waterfront Broadway S	Waterfront Avenue	188	10	198	210	3	213	21.9	12%	15	8%	✓	✓	1.6	1.0	✓	✓
	70	194	199	Waterfront Park	Waterfront Broadway N	24	1	25	8	0	8	-15.75	-66%	-17	-68%	✓	✓	4.0	4.2	✓	✓
	70	194	196	Waterfront Park	Waterfront Avenue	38	2	40	41	0	41	3	8%	1	3%	✓	✓	0.5	0.2	✓	✓
	70	194	10304	Waterfront Park	Waterfront Broadway S	60	3	63	66	0	66	6.15	10%	3	5%	✓	✓	0.8	0.4	✓	✓
Waterfront Avenue / Saltire Street																					
	72	10388	10194	Saltire Street	Waterfront Avenue E	5	0	5	2	1	3	-2.75	-58%	-2	-40%	✓	✓	1.5	1.0	✓	✓
	72	10388	10329	Saltire Street	Waterfront Avenue W	7	0	7	5	0	5	-1.65	-25%	-2	-29%	✓	✓	0.7	0.8	✓	✓
	72	10329	10329	Waterfront Avenue E	Waterfront Avenue W	165	9	174	186	3	189	20.7	13%	15	9%	✓	✓	1.6	1.1	✓	✓
	72	10329	10227	Waterfront Avenue E	Saltire Street	6	0	6	0	0	0	-5.7	-100%	-6	-100%	✓	✓	3.4	3.5	✓	✓
	72	10194	10227	Waterfront Avenue W	Saltire Street	11	1	12	7	0	7	-4.4	-39%	-5	-42%	✓	✓	1.5	1.6	✓	✓
	72	10194	10194	Waterfront Avenue W	Waterfront Avenue E	221	12	233	243	3	246	21.65	10%	13	6%	✓	✓	1.4	0.8	✓	✓
Waterfront Avenue / West Harbour Road																					
	71	211	10214	West Harbour Rd W	Chestnut St	0	0	0	1	0	1	1	0%	1	0%	✓	✓	1.4	1.4	✓	✓
	71	211	10340	West Harbour Rd W	West Harbour Rd E	34	2	36	45	0	45	10.8	32%	9	25%	✓	✓	1.7	1.4	✓	✓
	71	211	10338	West Harbour Rd W	Waterfront Avenue	27	1	28	27	0	27	0.4	2%	-1	-4%	✓	✓	0.1	0.2	✓	✓
	71	208	10340	Chestnut St	West Harbour Rd E	10	1	11	14	0	14	3.55	34%	3	27%	✓	✓	1.0	0.8	✓	✓
	71	208	10338	Chestnut St	Waterfront Avenue	38	2	40	44	0	44	6	16%	4	10%	✓	✓	0.9	0.6	✓	✓
	71	208	10215	Chestnut St	West Harbour Rd W	1	0	1	0	0	0	-0.95	-100%	-1	-100%	✓	✓	1.4	1.4	✓	✓
	71	210	10338	West Harbour Rd E	Waterfront Avenue	92	5	97	106	4	110	13.85	15%	13	13%	✓	✓	1.4	1.3	✓	✓
	71	210	10215	West Harbour Rd E	West Harbour Rd W	18	1	19	23	2	25	4.95	27%	6	32%	✓	✓	1.1	1.3	✓	✓
	71	210	10214	West Harbour Rd E	Chestnut St	19	1	20	23	2	25	4	21%	5	25%	✓	✓	0.9	1.1	✓	✓
	71	206	10215	Waterfront Avenue	West Harbour Rd W	13	1	14	11	0	11	-2.3	-17%	-3	-21%	✓	✓	0.7	0.8	✓	✓
	71	206	10214	Waterfront Avenue	Chestnut St	44	2	46	46	0	46	2.3	5%	0	0%	✓	✓	0.3	0.0	✓	✓
	71	206	10340	Waterfront Avenue	West Harbour Rd E	147	8	155	184	4	188	36.75	25%	33	21%	✓	✓	2.9	2.5	✓	✓
																99%	99%			97%	97%

	Movement					Observed Count			VISSIM Model					Criteria 1 - Difference		Criteria 2 - GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
																133	133			130	130
																134	134			134	134

Appendix B. South East Model Calibration

Table B.1: A7 / A701 Model Calibration AM 08:00-09:00

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
York Pl (W) / Elder St / York Pl (E) (Site 1 - Grontmij)																					
	1042	30269	30198	York Pl (W)	Elder St	91	2	93	45	5	50	-46	-57%	-43	-46%	✓	✓	5.4	5.1	×	×
	1042	30269	30493	York Pl (W)	York Pl (E)	485	25	510	515	26	541	30	7%	31	6%	✓	✓	0.5	1.4	✓	✓
	1042	30197	30157	York Pl (E)	York Pl (W)	413	26	439	409	24	433	-4	-1%	-6	-1%	✓	✓	1.0	0.3	✓	✓
	1042	30197	30198	York Pl (E)	Elder St	70	4	74	25	0	25	-45	-69%	-49	-66%	✓	✓	6.5	7.0	×	×
Broughton St (N) / York Pl / Cathedral Ln / Broughton St (E) / Picardy Pl (Site 4 - Grontmij)																					
	1043	30053	30052	York Pl	Broughton St	58	1	59	0	0	0										
	1043	30053	90055	York Pl	Picardy Pl	414	19	433	504	28	532	90	26%	99	23%	✓	✓	3.6	4.5	✓	✓
	1043	30494	90055	Broughton St	Picardy Pl	585	21	606	546	10	556	-39	-7%	-50	-8%	✓	✓	1.3	2.1	✓	✓
	1043	20911	30052	Picardy Pl	Broughton St	410	10	420	415	12	427	5	1%	7	2%	✓	✓	0.2	0.3	✓	✓
	1043	20911	644	Picardy Pl	York Pl	483	31	514	433	24	457	-50	-12%	-57	-11%	✓	✓	3.1	2.6	✓	✓
Leith Walk / Broughton St / Leith St (Site 5 - Grontmij)																					
	2	90055	30056	Picardy Pl	Leith Walk	829	40	869	846	33	879	17	2%	10	1%	✓	✓	0.7	0.3	✓	✓
	2	90055	11295	Picardy Pl	Leith St	466	15	481	392	10	402	-74	-18%	-79	-16%	✓	✓	3.6	3.8	✓	✓
	2	30058	20912	Leith Walk	Picardy	591	23	614	677	23	700	86	17%	86	14%	✓	✓	2.5	3.4	✓	✓
	2	30058	11295	Leith Walk	Leith St	257	17	274	220	10	230	-37	-17%	-44	-16%	✓	✓	1.3	2.8	✓	✓
	1	39863	20911	Leith St	Picardy	247	11	258	141	9	150	-106	-52%	-108	-42%	×	×	7.0	7.6	×	×
	1	39863	20916	Leith St	Leith Walk	245	16	261	202	8	210	-43	-21%	-51	-20%	✓	✓	1.9	3.3	✓	✓
Leith Walk / London Rd (Site 7 - Grontmij)																					
	3	90060	90084	Leith Walk (S)	London Rd	406	20	426	425	17	442	19	5%	16	4%	✓	✓	0.4	0.8	✓	✓
	3	90060	90063	Leith Walk (S)	Leith Walk (N)	413	18	431	421	16	437	8	2%	6	1%	✓	✓	1.1	0.3	✓	✓
	3	90060	90058	Leith Walk (S)	Leith Walk (S)	10	2	12	0	0	0	-10	-111%	-12	-100%	✓	✓	4.2	4.9	✓	✓
	3	99988	90063	London Rd	Leith Walk (N)	253	4	257	348	10	358	95	43%	101	39%	✓	×	5.3	5.8	×	×
	3	99988	90058	London Rd	Leith Walk (S)	537	16	553	491	12	503	-46	-10%	-50	-9%	✓	✓	3.1	2.2	✓	✓
	3	99988	90084	London Rd	London Rd	2	0	2	0	0	0	-2	-100%	-2	-100%	✓	✓	2.0	2.0	✓	✓
	3	90085	90058	Leith Walk (N)	Leith Walk (S)	423	23	446	416	22	438	-7	-2%	-8	-2%	✓	✓	0.1	0.4	✓	✓
	3	90085	90084	Leith Walk (N)	London Rd	72	2	74	61	4	65	-11	-17%	-9	-12%	✓	✓	1.7	1.1	✓	✓
	3	90085	90063	Leith Walk (N)	Leith Walk (N)	3	0	3	0	0	0	-3	-100%	-3	-100%	✓	✓	2.4	2.4	✓	✓
Leith Walk (N) / Annandale St / Leith Walk (S) / Montgomery St (Site 8 - Grontmij)																					
	11056	90101	90093	Leith Walk (N)	Annandale St	50	4	54	49	0	49	-1	-2%	-5	-9%	✓	✓	0.2	0.7	✓	✓
	11056	90101	90125	Leith Walk (N)	Leith Walk (S)	400	24	424	403	22	425	3	1%	1	0%	✓	✓	0.0	0.0	✓	✓
	11056	90101	90096	Leith Walk (N)	Montgomery St	11	1	12	0	0	0	-11	-122%	-12	-100%	✓	✓	4.2	4.9	✓	✓
	11056	90094	90125	Annandale St	Leith Walk (S)	64	1	65	43	1	44	-21	-40%	-21	-32%	✓	✓	2.2	2.8	✓	✓

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	11056	90094	90096	Annandale St	Montgomery St	120	2	122	121	4	125	1	1%	3	2%	✓	✓	0.2	0.3	✓	✓
	11056	90094	90002	Annandale St	Leith Walk (N)	107	0	107	102	1	103	-5	-6%	-4	-4%	✓	✓	0.2	0.4	✓	✓
	11056	90091	90096	Leith Walk (S)	Montgomery St	4	2	6	0	0	0	-4	-133%	-6	-100%	✓	✓	2.4	3.5	✓	✓
	11056	90091	90002	Leith Walk (S)	Leith Walk (N)	433	16	449	508	20	528	75	20%	79	18%	✓	✓	3.9	3.6	✓	✓
	11056	90091	90093	Leith Walk (S)	Annandale St	258	6	264	246	6	252	-12	-5%	-12	-5%	✓	✓	1.1	0.7	✓	✓
	11056	90123	90002	Montgomery St	Leith Walk (N)	2	0	2	0	2	2	-2	-200%	0	0%	✓	✓	1.4	0.0	✓	✓
	11056	90123	90093	Montgomery St	Annandale St	141	0	141	148	4	152	7	5%	11	8%	✓	✓	0.2	0.9	✓	✓
	11056	90123	90125	Montgomery St	Leith Walk (S)	28	0	28	40	2	42	12	50%	14	50%	✓	✓	1.9	2.4	✓	✓
Leith St (N) / Leith St (S) / Greenside Row (Site 9 - Grontmij)																					
	1045	40404	30042	Leith St (N)	Leith St (S)	603	31	634	578	19	597	-25	-5%	-37	-6%	✓	✓	0.0	1.5	✓	✓
	1045	40404	30045	Leith St (N)	Greenside Row	93	2	95	32	1	33	-61	-69%	-62	-65%	✓	✓	7.6	7.8	×	×
	1045	30044	30045	Leith St (S)	Greenside Row	40	2	42	48	2	50	8	21%	8	19%	✓	✓	0.3	1.2	✓	✓
	1045	30044	30044	Leith St (S)	Leith St (N)	493	26	519	328	17	345	-165	-40%	-174	-34%	×	×	7.3	8.4	×	×
	1045	30061	30044	Greenside Row	Leith St (N)	37	10	47	15	0	15	-22	-79%	-32	-68%	✓	✓	3.6	5.7	✓	×
	1045	30061	30042	Greenside Row	Leith St (S)	38	4	42	11	1	12	-27	-90%	-30	-71%	✓	✓	6.0	5.8	×	×
Leith Street (N) / St James Access / Leith St (S) / Calton Rd (Site 10 - Grontmij)																					
	1132	30042	30042	Leith St (N)	Leith St (S)	371	26	397	336	6	342	-35	-11%	-55	-14%	✓	✓	0.6	2.9	✓	✓
	1132	30042	30046	Leith St (N)	Calton Rd	247	5	252	189	12	201	-58	-26%	-51	-20%	✓	✓	4.2	3.4	✓	✓
	1132	704	30044	St James Access	Leith St (N)	10	3	13	13	7	20	3	30%	7	54%	✓	✓	0.7	1.7	✓	✓
	1132	30044	30044	Leith St (S)	Leith St (N)	539	25	564	364	12	376	-175	-38%	-188	-33%	×	×	7.3	8.7	×	×
	1132	30049	30042	Calton Rd	Leith St (S)	37	4	41	74	2	76	37	142%	35	85%	✓	✓	5.7	4.6	×	✓
Leith St / Princes St / Waterloo Pl (Grontmij Site 11)																					
	1022	30037	30020	Leith St	Waterloo Pl (E)	15	3	18	0	0	0	-15	-125%	-18	-100%	✓	✓	4.9	6.0	✓	×
	1022	30037	30034	Leith St	North Bridge	278	18	296	374	7	381	96	41%	85	29%	✓	✓	6.0	4.6	×	✓
	1022	30037	664	Leith St	Princes St	70	4	74	39	1	40	-31	-52%	-34	-46%	✓	✓	3.1	4.5	✓	✓
	1022	30023	30034	Waterloo Pl (E)	North Bridge	74	3	77	29	2	31	-45	-68%	-46	-60%	✓	✓	5.7	6.2	×	×
	1022	30023	664	Waterloo Pl (E)	Princes St	18	1	19	56	8	64	38	229%	45	233%	✓	✓	5.2	6.9	×	×
	1022	30023	30036	Waterloo Pl (E)	Leith St	57	3	60	43	1	44	-14	-26%	-16	-27%	✓	✓	1.6	2.2	✓	✓
	1022	30031	664	North Bridge	Princes St	52	2	54	27	0	27	-25	-57%	-27	-50%	✓	✓	4.2	4.2	✓	✓
	1022	30031	30036	North Bridge	Leith St	439	19	457	330	15	345	-109	-29%	-112	-25%	×	×	5.5	5.6	×	×
	1022	30031	30020	North Bridge	Waterloo Pl (E)	26	1	27	65	0	65	39	180%	38	142%	✓	✓	5.9	5.6	×	×
	1022	746	30036	Princes St	Leith St	51	1	52	7	0	7	-44	-88%	-45	-86%	✓	✓	9.1	8.3	×	×
	1022	746	30020	Princes St	Waterloo Pl (E)	21	1	22	16	0	16	-5	-25%	-6	-26%	✓	✓	2.3	1.3	✓	✓
	1022	746	30034	Princes St	North Bridge	77	6	84	1	0	1	-76	-109%	-83	-99%	✓	✓	11.6	12.7	×	×

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
George St/ Hanover St (Tracsis site 87 2016)																					
	1010	30010	30234	Hanover St (N)	Hanover St (N)	1	0	1	10	0	10	9	900%	9	900%	✓	✓	2.7	3.8	✓	✓
	1010	30010	725	Hanover St (N)	George St (E)	33	3	36	27	0	27	-6	-21%	-9	-25%	✓	✓	1.0	1.6	✓	✓
	1010	30010	30236	Hanover St (N)	Hanover St (S)	197	10	207	181	6	187	-16	-9%	-20	-10%	✓	✓	1.8	1.4	✓	✓
	1010	30010	30233	Hanover St (N)	George St (W)	24	3	27	34	3	37	10	53%	10	37%	✓	✓	2.4	1.8	✓	✓
	1010	30014	30234	George St (E)	Hanover St (N)	42	1	43	53	5	58	11	31%	15	35%	✓	✓	1.0	2.1	✓	✓
	1010	30014	30235	George St (E)	George St (E)	1	0	1	0	0	0	-1	0%	-1	-100%	✓	✓	0.0	1.4	✓	✓
	1010	30014	30236	George St (E)	Hanover St (S)	9	2	11	60	0	60	51	850%	49	445%	✓	✓	7.7	8.2	×	×
	1010	30014	30233	George St (E)	George St (W)	33	6	39	71	4	75	38	211%	36	92%	✓	✓	6.8	4.8	×	✓
	1010	30059	30234	Hanover St (S)	Hanover St (N)	299	11	310	294	7	301	-5	-2%	-9	-3%	✓	✓	1.6	0.5	✓	✓
	1010	30059	725	Hanover St (S)	George St (E)	36	0	36	33	0	33	-3	-11%	-3	-8%	✓	✓	0.6	0.5	✓	✓
	1010	30059	30236	Hanover St (S)	Hanover St (S)	1	0	1	0	0	0	-1	0%	-1	-100%	✓	✓	0.0	1.4	✓	✓
	1010	30059	30233	Hanover St (S)	George St (W)	73	1	74	122	0	122	49	74%	48	65%	✓	✓	4.2	4.8	✓	✓
	1010	30012	30234	George St (W)	Hanover St (N)	23	6	29	42	1	43	19	127%	14	48%	✓	✓	3.0	2.3	✓	✓
	1010	30012	725	George St (W)	George St (E)	33	0	33	41	2	43	8	29%	10	30%	✓	✓	0.4	1.6	✓	✓
	1010	30012	30236	George St (W)	Hanover St (S)	78	1	79	84	0	84	6	9%	5	6%	✓	✓	1.4	0.6	✓	✓
	1010	30012	30233	George St (W)	George St (W)	11	1	12	16	6	22	5	56%	10	83%	✓	✓	4.2	2.4	✓	✓
Lawnmarket/ Bank St/ High St/ George IV Bridge (Tracsis site 22 2016)																					
	1015	816	817	Bank St	George IV Bridge	229	10	239	263	7	270	34	16%	31	13%	✓	✓	1.0	1.9	✓	✓
	1015	816	30347	Bank St	Lawnmarket	27	1	28	49	6	55	22	105%	27	96%	✓	✓	2.1	4.2	✓	✓
	1015	30124	815	George IV Bridge	Bank St	338	11	349	272	8	280	-66	-24%	-69	-20%	✓	✓	2.5	3.9	✓	✓
	1015	30124	30347	George IV Bridge	Lawnmarket	46	7	53	17	5	22	-29	-104%	-31	-58%	✓	✓	2.6	5.1	✓	×
	1015	30135	815	Lawnmarket	Bank St	20	5	25	17	0	17	-3	-19%	-8	-32%	✓	✓	0.2	1.7	✓	✓
	1015	30135	817	Lawnmarket	George IV Bridge	15	1	16	10	0	10	-5	-56%	-6	-38%	✓	✓	0.3	1.7	✓	✓
Chambers St/ George IV Bridge (Tracsis site 103 2016)																					
	30238	119	20286	George IV Bridge (N)	Chambers St	20	1	21	44	0	44	24	150%	23	110%	✓	✓	4.5	4.0	✓	✓
	30238	119	119	George IV Bridge (N)	George IV Bridge (S)	277	12	289	229	7	236	-48	-20%	-53	-18%	✓	✓	3.2	3.3	✓	✓
	30238	20285	118	Chambers St	George IV Bridge (N)	8	2	10	0	0	0	-8	-114%	-10	-100%	✓	✓	3.7	4.5	✓	✓
	30238	20285	119	Chambers St	George IV Bridge (S)	122	6	128	69	10	79	-53	-53%	-49	-38%	✓	✓	4.9	4.8	✓	✓
	30238	118	118	George IV Bridge (S)	George IV Bridge (N)	320	20	340	292	13	305	-28	-11%	-35	-10%	✓	✓	0.6	1.9	✓	✓
	30238	118	20286	George IV Bridge (S)	Chambers St	106	2	108	126	3	129	20	21%	21	19%	✓	✓	1.6	1.9	✓	✓
Forest Rd/ George IV Bridge (Tracsis site 5 2016)						0		0	0		0										
	30263	85	85	George IV Bridge	Bristo Pl	371	19	390	302	17	319	-69	-21%	-71	-18%	✓	✓	3.8	3.8	✓	✓
	30263	93	118	Forrest Rd	George IV Bridge	517	23	540	431	17	448	-86	-20%	-92	-17%	✓	✓	2.9	4.1	✓	✓
	30263	93	85	Forrest Rd	Bristo Pl	171	8	179	99	2	101	-72	-49%	-78	-44%	✓	✓	5.8	6.6	×	×
Lauriston Pl/ Forrest Rd (Tracsis site 25 2016)																					

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	30241	47	94	Teviot Pl	Forrest Rd	307	16	323	204	7	211	-103	-42%	-112	-35%	×	×	4.5	6.9	✓	×
	30241	47	69	Teviot Pl	Lauriston Pl	501	22	523	429	12	441	-72	-16%	-82	-16%	✓	✓	4.0	3.7	✓	✓
	30241	84	94	Lauriston Pl	Forrest Rd	375	15	390	330	12	342	-45	-13%	-48	-12%	✓	✓	2.9	2.5	✓	✓
Waverly Bridge/ Market St (Tracsis site 111 2016)																					
	1024	30131	30126	Market St (E)	Market St (W)	149	3	152	239	9	248	90	70%	96	63%	✓	✓	6.0	6.8	×	×
	1024	30125	30130	Market St (W)	Market St (E)	66	3	69	106	2	108	40	70%	39	57%	✓	✓	3.8	4.1	✓	✓
Cowgatehead/ Cowgate/ Candlemaker Row (Tracsis site 21 2016)																					
	30236	524	124	Cowgate	Candlemaker Row	5	1	6	0	0	0	-5	-100%	-6	-100%	✓	✓	3.2	3.5	✓	✓
	30236	524	128	Cowgate	Cowgatehead	565	8	573	591	15	606	26	5%	33	6%	✓	✓	0.5	1.4	✓	✓
	30236	125	560	Candlemaker Row	Cowgate	29	3	32	10	0	10	-19	-79%	-22	-69%	✓	✓	3.4	4.8	✓	✓
	30236	125	128	Candlemaker Row	Cowgatehead	63	3	66	3	1	4	-60	-125%	-62	-94%	✓	✓	8.9	10.5	×	×
	30236	127	560	Cowgatehead	Cowgate	375	22	397	474	26	500	99	33%	103	26%	✓	×	4.3	4.9	✓	✓
	30236	127	124	Cowgatehead	Candlemaker Row	6	0	6	0	0	0	-6	-200%	-6	-100%	✓	✓	2.4	3.5	✓	✓
The Royal Mile/ New St (Tracsis site 40 2016)																					
	178	30611	541	New St	Canongate	22	0	22	2	0	2	-20	-95%	-20	-91%	✓	✓	5.6	5.8	×	×
	178	30611	30536	New St	The Royal Mile	54	1	55	107	2	109	53	110%	54	98%	✓	✓	5.8	6.0	×	×
	178	30536	30536	Canongate	The Royal Mile	299	13	312	308	5	313	9	4%	1	0%	✓	✓	1.1	0.1	✓	✓
	178	541	541	The Royal Mile	Canongate	176	16	192	207	4	211	31	24%	19	10%	✓	✓	4.4	1.3	✓	✓
Grassmarket/ Cowgatehead/ West Bow (Tracsis site 61 2016)																					
	30235	128	129	Cowgatehead	West Bow	28	4	32	0		0										
	30235	128	128	Cowgatehead	Grassmarket	603	7	610	596	16	612	-7	-1%	2	0%	✓	✓	0.8	0.1	✓	✓
	30235	127	129	Grassmarket	West Bow	107	13	120	0		0										
	30235	127	127	Grassmarket	Cowgatehead	388	23	411	472	26	498	84	27%	87	21%	✓	✓	3.7	4.1	✓	✓
West Preston St/ Causewayside/ Summerhall Pl (Tracsis site 34 2016)																					
	55	72	77	W Preston St	Causewayside	22	0	22	3	0	3	-19	-95%	-19	-86%	✓	✓	5.0	5.4	×	×
	55	72	76	W Preston St	Summerhall Pl	211	3	214	247	4	251	36	19%	37	17%	✓	✓	2.6	2.4	✓	✓
	55	73	67	Causewayside	W Preston St	109	1	110	130	3	133	21	20%	23	21%	✓	✓	1.9	2.1	✓	✓
	55	73	76	Causewayside	Summerhall Pl	324	13	337	432	17	449	108	41%	112	33%	×	×	6.7	5.6	×	×
	55	75	67	Summerhall Pl	W Preston St	162	4	166	129	1	130	-33	-22%	-36	-22%	✓	✓	2.5	3.0	✓	✓
	55	75	77	Summerhall Pl	Causewayside	228	8	236	288	12	300	60	30%	64	27%	✓	✓	3.8	3.9	✓	✓
High St/ North Bridge/ South Bridge (Tracsis site 6 2016)																					
	182	500	556	North Bridge	High St (E)	14	3	17	0	0	0	-14	-140%	-17	-100%	✓	✓	4.5	5.8	✓	×
	182	500	558	North Bridge	South Bridge	273	14	287	395	9	404	122	52%	117	41%	×	×	7.0	6.3	×	×
	182	500	30347	North Bridge	High St (W)	26	6	32	0	0	0	-26									
	182	543	580	High St (E)	North Bridge	41	1	42	3	0	3	-38	-103%	-39	-93%	✓	✓	7.6	8.2	×	×
	182	543	558	High St (E)	South Bridge	38	4	42	0	0	0	-38	-127%	-42	-100%	✓	✓	7.7	9.2	×	×

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	182	579	580	South Bridge	North Bridge	416	17	433	409	14	423	-7	-2%	-10	-2%	✓	✓	1.2	0.5	✓	✓
	182	579	556	South Bridge	High St (E)	14	0	14	0	0	0	-14									
	182	579	30347	South Bridge	High St (W)	39	3	42	0	0	0	-39									
Nicolson St/ W Nicolson St/ W Richmond St (Tracsis site 99 2016)																					
	47	30319	209	Nicolson St (N)	W Richmond St	13	0	13	0	0	0	-13	-144%	-13	-100%	✓	✓	4.2	5.1	✓	×
	47	30319	30318	Nicolson St (N)	Nicolson St (S)	179	15	194	284	2	286	105	73%	92	47%	×	✓	7.9	5.9	×	×
	47	30319	207	Nicolson St (N)	W Nicolson St	11	2	13	0	0	0	-11	-122%	-13	-100%	✓	✓	4.2	5.1	✓	×
	47	590	271	W Richmond St	Nicolson St (N)	35	0	35	33	1	34	-2	-7%	-1	-3%	✓	✓	0.2	0.2	✓	✓
	47	590	30318	W Richmond St	Nicolson St (S)	18	2	20	5	0	5	-13	-93%	-15	-75%	✓	✓	3.3	4.2	✓	✓
	47	590	207	W Richmond St	W Nicolson St	70	7	77	32	0	32	-38	-61%	-45	-58%	✓	✓	5.2	6.1	×	×
	47	271	271	Nicolson St (S)	Nicolson St (N)	361	15	376	295	9	304	-66	-21%	-72	-19%	✓	✓	4.1	3.9	✓	✓
	47	271	209	Nicolson St (S)	W Richmond St	23	0	23	29	6	35	6	33%	12	52%	✓	✓	1.3	2.2	✓	✓
	47	271	207	Nicolson St (S)	W Nicolson St	9	1	10	101	0	101	92	1022%	91	910%	✓	✓	11.3	12.2	×	×
	47	460	271	W Nicolson St	Nicolson St (N)	57	1	58	82	5	87	25	50%	29	50%	✓	✓	2.2	3.4	✓	✓
	47	460	209	W Nicolson St	W Richmond St	77	0	77	50	0	50	-27	-42%	-27	-35%	✓	✓	2.6	3.4	✓	✓
	47	460	30318	W Nicolson St	Nicolson St (S)	13	0	13	22	0	22	9	82%	9	69%	✓	✓	1.8	2.2	✓	✓
South Clerk St/ Hope Park Terrace/ Bernard Terr (Tracsis site 4 2016)																					
	41	260	99	S Clerk St (N)	Bernard Terrace	24	1	25	67	0	67	43	215%	42	168%	✓	✓	6.2	6.2	×	×
	41	260	260	S Clerk St (N)	S Clerk St (S)	132	11	143	150	1	151	18	15%	8	6%	✓	✓	1.5	0.7	✓	✓
	41	260	89	S Clerk St (N)	Hope Park Ter	28	0	28	81	0	81	53	353%	53	189%	✓	✓	8.8	7.2	×	×
	41	101	259	Bernard Ter	S Clerk St (N)	15	3	18	135	3	138	120	923%	120	667%	×	×	12.9	13.6	×	×
	41	101	260	Bernard Ter	S Clerk St (S)	7	0	7	14	0	14	7	100%	7	100%	✓	✓	2.2	2.2	✓	✓
	41	101	89	Bernard Ter	Hope Park Ter	168	3	171	209	1	210	41	28%	39	23%	✓	✓	3.1	2.8	✓	✓
	41	259	259	S Clerk St (S)	S Clerk St (N)	402	9	411	284	9	293	-118	-34%	-118	-29%	×	×	6.6	6.3	×	×
	41	259	99	S Clerk St (S)	Bernard Terrace	11	2	13	0	0	0	-11	-183%	-13	-100%	✓	✓	3.5	5.1	✓	×
	41	259	89	S Clerk St (S)	Hope Park Ter	56	3	59	158	5	163	102	213%	104	176%	×	×	9.4	9.9	×	×
	41	107	259	Hope Park Ter	S Clerk St (N)	43	5	48	31	4	35	-12	-32%	-13	-27%	✓	✓	2.5	2.0	✓	✓
	41	107	99	Hope Park Ter	Bernard Terrace	183	6	189	151	0	151	-32	-20%	-38	-20%	✓	✓	2.4	2.9	✓	✓
	41	107	260	Hope Park Ter	S Clerk St (S)	46	0	46	101	5	106	55	128%	60	130%	✓	✓	5.8	6.9	×	×
Newington Rd/ Salisbury Rd/ Minto St/ Salisbury Pl (Tracsis site 107 2016)																					
	37	252	248	Newington Rd	Minto St	192	11	203	259	3	262	67	40%	59	29%	✓	✓	4.8	3.9	✓	✓
	37	252	57	Newington Rd	Salisbury Pl	40	1	41	21	0	21	-19	-56%	-20	-49%	✓	✓	2.9	3.6	✓	✓
	37	58	464	Salisbury Rd	Minto St	33	0	33	65	0	65	32	103%	32	97%	✓	✓	4.3	4.6	✓	✓
	37	58	57	Salisbury Rd	Salisbury Pl	276	2	278	186	2	188	-90	-35%	-90	-32%	✓	✓	5.3	5.9	×	×
	37	58	248	Salisbury Rd	Newington Rd	2	2	4	81	0	81	79	3950%	77	1925%	✓	✓	12.1	11.8	×	×
	37	30267	57	Minto St	Salisbury Pl	165	0	165	42	0	42	-123	-85%	-123	-75%	×	×	10.8	12.1	×	×

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	37	30267	464	Minto St	Newington Rd	476	14	490	528	12	540	52	13%	50	10%	✓	✓	2.3	2.2	✓	✓
	37	56	464	Salisbury Pl	Newington Rd	115	0	115	79	3	82	-36	-34%	-33	-29%	✓	✓	3.5	3.3	✓	✓
	37	56	248	Salisbury Pl	Minto St	94	2	96	62	2	64	-32	-39%	-32	-33%	✓	✓	3.1	3.6	✓	✓
Pleasance/ Cowgate/ St Mary's St/ Holyrood Rd (Tracsis site 10 2016)																					
	189	548	527	Pleasance	Cowgate	194	6	200	103	8	111	-91	-49%	-89	-45%	✓	✓	8.6	7.1	×	×
	189	548	551	Pleasance	St Mary's St	184	8	192	200	1	201	16	11%	9	5%	✓	✓	2.5	0.6	✓	✓
	189	548	526	Pleasance	Holyrood Rd	94	2	96	72	0	72	-22	-28%	-24	-25%	✓	✓	2.2	2.6	✓	✓
	189	523	30600	Cowgate	Pleasance	65	4	69	97	0	97	32	82%	28	41%	✓	✓	4.9	3.1	✓	✓
	189	523	551	Cowgate	St Mary's St	54	7	61	136	19	155	82	228%	94	154%	✓	✓	7.0	9.0	×	×
	189	523	526	Cowgate	Holyrood Rd	203	7	210	266	7	273	63	35%	63	30%	✓	✓	3.7	4.1	✓	✓
	189	549	30600	St Mary's St	Pleasance	154	3	157	96	0	96	-58	-46%	-61	-39%	✓	✓	3.3	5.4	✓	×
	189	549	527	St Mary's St	Cowgate	109	3	112	140	3	143	31	34%	31	28%	✓	✓	2.8	2.7	✓	✓
	189	549	526	St Mary's St	Holyrood Rd	24	3	27	88	1	89	64	305%	62	230%	✓	✓	8.5	8.1	×	×
	189	529	30600	Holyrood Rd	Pleasance	46	5	51	98	3	101	52	163%	50	98%	✓	✓	6.8	5.7	×	×
	189	529	527	Holyrood Rd	Cowgate	296	4	300	397	4	401	101	37%	101	34%	×	×	5.2	5.4	×	×
	189	529	551	Holyrood Rd	St Mary's St	10	1	11	0	0	0	-10	-143%	-11	-100%	✓	✓	3.7	4.7	✓	✓
Pleasance/ West Richmond St (Tracsis site 112 2016)																					
	205	588	30658	Pleasance (N)	Brown St	6	0	6	2	0	2	-4	-100%	-4	-67%	✓	✓	1.9	2.0	✓	✓
	205	588	589	Pleasance (N)	Pleasance (S)	229	10	239	235	2	237	6	3%	-2	-1%	✓	✓	2.0	0.1	✓	✓
	205	588	590	Pleasance (N)	W Richmond St	29	1	30	51	1	52	22	96%	22	73%	✓	✓	2.9	3.4	✓	✓
	205	661	30660	Brown St	Pleasance (N)	3	0	3	0	0	0	-3	-100%	-3	-100%	✓	✓	2.4	2.4	✓	✓
	205	661	589	Brown St	Pleasance (S)	6	2	8	0	0	0	-6	-100%	-8	-100%	✓	✓	3.5	4.0	✓	✓
	205	661	590	Brown St	W Richmond St	10	1	11	0	0	0	-10	-143%	-11	-100%	✓	✓	3.7	4.7	✓	✓
	205	30659	30660	Pleasance (S)	Pleasance (N)	448	11	459	330	2	332	-118	-30%	-127	-28%	×	×	5.4	6.4	×	×
	205	30659	30658	Pleasance (S)	Brown St	5	2	7	2	0	2	-3	-60%	-5	-71%	✓	✓	1.6	2.4	✓	✓
	205	30659	590	Pleasance (S)	W Richmond St	81	8	89	9	0	9	-72	-96%	-80	-90%	✓	✓	10.2	11.4	×	×
	205	209	30660	W Richmond St	Pleasance (N)	34	2	36	61	7	68	27	84%	32	89%	✓	✓	3.1	4.4	✓	✓
	205	209	30658	W Richmond St	Brown St	8	2	10	9	0	9	1	17%	-1	-10%	✓	✓	1.1	0.3	✓	✓
	205	209	589	W Richmond St	Pleasance (S)	31	0	31	9	0	9	-22	-85%	-22	-71%	✓	✓	4.1	4.9	✓	✓
East Preston Street/ Dalkeith Rd (Tracsis site 13 2016)																					
	68	163	163	Dalkeith Rd (N)	Dalkeith Rd (S)	363	10	373	274	2	276	-89	-29%	-97	-26%	✓	✓	4.0	5.4	✓	×
	68	163	63	Dalkeith Rd (N)	E Preston St	13	1	14	73	0	73	60	545%	59	421%	✓	✓	9.2	8.9	×	×
	68	166	167	Dalkeith Rd (S)	Dalkeith Rd (N)	593	15	608	616	4	620	23	4%	12	2%	✓	✓	1.0	0.5	✓	✓
	68	166	63	Dalkeith Rd (S)	E Preston St	220	2	222	241	3	244	21	10%	22	10%	✓	✓	0.9	1.4	✓	✓
	68	115	167	E Preston St	Dalkeith Rd (N)	55	1	56	59	1	60	4	9%	4	7%	✓	✓	0.8	0.5	✓	✓
	68	115	163	E Preston St	Dalkeith Rd (S)	311	4	315	447	7	454	136	46%	139	44%	×	×	6.4	7.1	×	×

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
Dalkeith Rd/ Holyrood Park Rd (Tracsis site 84 2016)																					
	67	163	122	A7 Dalkeith Rd (N)	Holyrood Park Rd	339	5	344	320	1	321	-19	-6%	-23	-7%	✓	✓	1.4	1.3	✓	✓
	67	163	165	A7 Dalkeith Rd (N)	A7 Dalkeith Rd (S)	381	19	400	659	8	667	278	84%	267	67%	×	×	13.8	11.6	×	×
	67	30635	165	Holyrood Park Rd	A7 Dalkeith Rd (S)	677	5	682	318	5	323	-359	-56%	-359	-53%	×	×	14.9	16.0	×	×
	67	30635	166	Holyrood Park Rd	A7 Dalkeith Rd (N)	439	3	442	341	0	341	-98	-23%	-101	-23%	✓	×	5.2	5.1	×	×
	67	169	166	A7 Dalkeith Rd (S)	A7 Dalkeith Rd (N)	475	14	489	512	7	519	37	9%	30	6%	✓	✓	1.9	1.3	✓	✓
	67	121	122	A7 Dalkeith Rd (N)	Holyrood Park Rd	404	6	410	278	1	279	-126	-34%	-131	-32%	×	×	6.6	7.1	×	×
Dalkeith Rd/ Salisbury Rd (Tracsis site 59 2016)																					
	158	165	165	Dalkeith Rd (N)	Dalkeith Rd (S)	755	14	769	715	13	728	-40	-6%	-41	-5%	✓	✓	0.7	1.5	✓	✓
	158	461	59	Dalkeith Rd (N)	Salisbury Rd	304	1	305	220	2	222	-84	-30%	-83	-27%	✓	✓	4.8	5.1	✓	×
	158	174	59	Dalkeith Rd (S)	Salisbury Rd	17	0	17	130	0	130	113	942%	113	665%	×	×	13.8	13.2	×	×
	158			Dalkeith Rd (S)	Dalkeith Rd (N)	851	20	871	1024	14	1038	173	22%	167	19%	×	×	5.0	5.4	×	×
	158	174	169	Dalkeith Rd (S)	Dalkeith Rd (N)				512	7	519										
	158	121	121	Dalkeith Rd (S)	Dalkeith Rd (N)				277	2	279										
Broughton St/ E London St/ Mansfield Pl/ London St (Tracisis site 37 2016)																					
	1043	30494	90055	Broughton St SB		531	9	540	546	10	556	15	3%	16	3%	✓	✓	1.3	0.7	✓	✓
	1043	20911	30052	Broughton St NB		374	13	387	415	12	427	41	13%	40	10%	✓	✓	1.9	2.0	✓	✓
Queen St/ N St David St (Tracsis site 43 2016)																					
	1040	30274	30154	Queen St (E)	N St David St	39	2	41	9	2	11	-30	-94%	-30	-73%	✓	✓	6.0	5.9	×	×
	1040	30274	30148	Queen St (E)	Queen St (W)	469	32	501	410	22	432	-59	-15%	-69	-14%	✓	✓	2.9	3.2	✓	✓
	1040	660	30147	N St David St	Queen St (E)	39	3	42	81	5	86	42	131%	44	105%	✓	✓	5.4	5.5	×	×
	1040	660	30148	N St David St	Queen St (W)	88	11	99	42	3	45	-46	-67%	-54	-55%	✓	✓	4.6	6.4	✓	×
	1040	30147	30147	Queen St (W)	Queen St (E)	448	21	469	486	26	512	38	10%	43	9%	✓	✓	1.7	1.9	✓	✓
	1040	30147	30154	Queen St (W)	N St David St	67	5	72	15	2	17	-52	-111%	-55	-76%	✓	✓	8.0	8.2	×	×
Princes St/ S St David St (Tracsis site 36 2016)																					
	1153	30277	30552	S St David St	Princes St (E)	53	8	61	28	0	28	-25	-57%	-33	-54%	✓	✓	4.5	4.9	✓	✓
	1153	30277	30018	S St David St	Princes St (W)																
	1153	636	30146	Princes St (E)	S St David St	165	9	174	123	9	132	-42	-30%	-42	-24%	✓	✓	3.3	3.4	✓	✓
	1153	30016	30018	Princes St (E)	Princes St (W)																
	1153	30552	30146	Princes St (W)	S St David St																
	1153	30552	30552	Princes St (W)	Princes St (E)																
Easter Rd/ London Rd (Tracsis site 96 2016)																					
	118	329	48	Easter Rd (N)	E Norton Pl	28	4	32	13	2	15	-15	-88%	-17	-53%	✓	✓	1.3	3.5	✓	✓
	118	329	220	Easter Rd (N)	Easter Rd (S)	244	2	246	247	3	250	3	1%	4	2%	✓	✓	0.0	0.3	✓	✓
	118	329	25	Easter Rd (N)	London Rd	29	2	31	13	1	14	-16	-64%	-17	-55%	✓	✓	3.6	3.6	✓	✓
	118	49	120303	E Norton Pl	Easter Rd (N)	8	0	8	0	0	0	-8	-114%	-8	-100%	✓	✓	3.7	4.0	✓	✓

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	118	49	220	E Norton Pl	Easter Rd (S)	3	0	3	6	0	6	3	300%	3	100%	✓	✓	2.3	1.4	✓	✓
	118	49	25	E Norton Pl	London Rd	551	18	569	609	18	627	58	13%	58	10%	✓	✓	1.9	2.4	✓	✓
	118	45	120303	Easter Rd (S)	Easter Rd (N)	277	10	287	224	2	226	-53	-23%	-61	-21%	✓	✓	2.4	3.8	✓	✓
	118	45	48	Easter Rd (S)	E Norton Pl	4	0	4	18	0	18	14	700%	14	350%	✓	✓	4.7	4.2	✓	✓
	118	45	25	Easter Rd (S)	London Rd	66	6	72	156	5	161	90	145%	89	124%	✓	✓	8.1	8.2	×	×
	118	43	120303	London Rd	Easter Rd (N)	59	2	61	34	1	35	-25	-60%	-26	-43%	✓	✓	3.3	3.8	✓	✓
	118	43	48	London Rd	E Norton Pl	356	18	374	382	19	401	26	9%	27	7%	✓	✓	1.6	1.4	✓	✓
	118	44	220	London Rd	Easter Rd (S)	75	0	75	46	2	48	-29	-47%	-27	-36%	✓	✓	2.9	3.4	✓	✓
Calton Rd/ Abbeyhill (Tracsis site 57 2016)																					
	50176	496	532	Abbeyhill (N)	Abbeyhill (S)	570	9	579	669	6	675	99	20%	96	17%	✓	✓	5.2	3.8	×	✓
	50176	496	535	Abbeyhill (N)	Calton Rd	69	2	71	12	0	12	-57	-106%	-59	-83%	✓	✓	7.8	9.2	×	×
	50176	534	536	Abbeyhill (S)	Abbeyhill (N)	530	18	548	458	9	467	-72	-16%	-81	-15%	✓	✓	2.4	3.6	✓	✓
	50176	534	535	Abbeyhill (S)	Calton Rd	94	0	94	133	1	134	39	44%	40	43%	✓	✓	2.7	3.7	✓	✓
	50176	498	536	Calton Rd	Abbeyhill (N)	49	4	53	18	5	23	-31	-76%	-30	-57%	✓	✓	4.9	4.9	✓	✓
	50176	498	532	Calton Rd	Abbeyhill (S)	61	3	64	32	4	36	-29	-48%	-28	-44%	✓	✓	5.3	4.0	×	✓
Horse Wynd/ Queen's Drive (Tracsis site 69 2016)																					
	30228	156	155	Horse Wynd	Horse Wynd	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
	30228	156	154	Horse Wynd	Queen's Drive (E)	48	0	48	46	0	46	-2	-4%	-2	-4%	✓	✓	1.1	0.3	✓	✓
	30228	156	240	Horse Wynd	Queen's Drive (W)	435	4	439	404	6	410	-31	-8%	-29	-7%	✓	✓	1.0	1.4	✓	✓
	30228	153	155	Queen's Drive (E)	Horse Wynd	138	0	138	100	0	100	-38	-29%	-38	-28%	✓	✓	5.4	3.5	×	✓
	30228	153	154	Queen's Drive (E)	Queen's Drive (E)	0	1	1	0	0	0	0	0%	-1	-100%	✓	✓	0.0	1.4	✓	✓
	30228	153	240	Queen's Drive (E)	Queen's Drive (W)	401	1	402	389	0	389	-12	-3%	-13	-3%	✓	✓	1.5	0.7	✓	✓
	30228	1	155	Queen's Drive (W)	Horse Wynd	455	6	461	341	6	347	-114	-27%	-114	-25%	×	×	6.0	5.7	×	×
	30228	1	154	Queen's Drive (W)	Queen's Drive (E)	308	1	309	274	0	274	-34	-12%	-35	-11%	✓	✓	2.8	2.0	✓	✓
	30228	1	240	Queen's Drive (W)	Queen's Drive (W)	0	0	0	0	0	0	0	0%	0	0%	✓	✓	0.0	0.0	✓	✓
Horse Wynd/ Canongate/ Abbeyhill																					
	50175	532	533	Abbeyhill	Horse Wynd	428	7	435	434	6	440	6	2%	5	1%	✓	✓	1.2	0.2	✓	✓
	50175	532	534	Abbeyhill	Abbeyhill	12	0	12	0	0	0	-12	-171%	-12	-100%	✓	✓	3.7	4.9	✓	✓
	50175	532	531	Abbeyhill	Canongate	175	22	197	269	4	273	94	70%	76	39%	✓	✓	7.4	5.0	×	✓
	50175	539	534	Horse Wynd	Abbeyhill	470	6	476	386	6	392	-84	-19%	-84	-18%	✓	✓	4.7	4.0	✓	✓
	50175	539	531	Horse Wynd	Canongate	116	3	119	49	1	50	-67	-58%	-69	-58%	✓	✓	8.9	7.5	×	×
	50175	539	533	Horse Wynd	Horse Wynd	2	0	2	4	0	4	2	100%	2	100%	✓	✓	0.0	1.2	✓	✓
	50175	541	534	Canongate	Abbeyhill	176	17	193	205	4	209	29	20%	16	8%	✓	✓	2.8	1.1	✓	✓
	50175	541	533	Canongate	Horse Wynd	35	1	36	12	0	12	-23	-70%	-24	-67%	✓	✓	4.4	4.9	✓	✓
	50175	541	531	Canongate	Canongate	5	0	5	0	0	0	-5	-100%	-5	-100%	✓	✓	3.2	3.2	✓	✓
Melville Dr/ Hope Park Ter/ Summerhall Cres/ Hope Park Cres																					

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	52	88	106	Melville Dr	Hope Park Ter	207	8	215	234	3	237	27	15%	22	10%	✓	✓	1.3	1.5	✓	✓
	52	88	90	Melville Dr	Summerhall Cres	139	4	143	117	4	121	-22	-18%	-22	-15%	✓	✓	1.8	1.9	✓	✓
	52	88	493	Melville Dr	Hope Par Cres	137	1	138	64	0	64	-73	-60%	-74	-54%	✓	✓	6.1	7.4	×	×
	52	95	96	Hope Park Ter	Melville Dr	183	6	189	263	0	263	80	49%	74	39%	✓	✓	5.3	4.9	×	✓
	52	95	90	Hope Park Ter	Summerhall Cres	65	2	67	68	1	69	3	6%	2	3%	✓	✓	2.0	0.2	✓	✓
	52	95	493	Hope Park Ter	Hope Par Cres	54	3	57	113	5	118	59	126%	61	107%	✓	✓	5.8	6.5	×	×
	52	82	96	Summerhall Cres	Melville Dr	220	4	224	218	7	225	-2	-1%	1	0%	✓	✓	0.2	0.1	✓	✓
	52	462	106	Summerhall Cres	Hope Park Ter	41	1	42	31	4	35	-10	-26%	-7	-17%	✓	✓	3.3	1.1	✓	✓
	52	462	493	Summerhall Cres	Hope Par Cres	637	15	652	307	8	315	-330	-57%	-337	-52%	×	×	14.9	15.3	×	×
	52	572	96	Hope Par Cres	Melville Dr	34	2	36	17	0	17	-17	-53%	-19	-53%	✓	✓	3.8	3.7	✓	✓
	52	572	106	Hope Par Cres	Hope Park Ter	37	3	40	22	2	24	-15	-47%	-16	-40%	✓	✓	2.1	2.8	✓	✓
	52	572	90	Hope Par Cres	Summerhall Cres	265	8	273	112	4	116	-153	-65%	-157	-58%	×	×	11.2	11.3	×	×
South Clerk St/ East Preston St/ West Preston St/ Newington Rd																					
	39	255	70	S Clerk St	East Preston St	36	1	37	98	3	101	62	194%	64	173%	✓	✓	7.7	7.7	×	×
	39	255	254	S Clerk St	Newington Rd	203	13	216	164	3	167	-39	-22%	-49	-23%	✓	✓	2.7	3.5	✓	✓
	39	255	68	S Clerk St	West Preston St	11	0	11	0	0	0	-11	-122%	-11	-100%	✓	✓	4.2	4.7	✓	✓
	39	485	482	East Preston St	S Clerk St	9	2	11	0	0	0	-9	-129%	-11	-100%	✓	✓	3.7	4.7	✓	✓
	39	485	254	East Preston St	Newington Rd	18	0	18	85	0	85	67	515%	67	372%	✓	✓	9.8	9.3	×	×
	39	485	68	East Preston St	West Preston St	270	4	274	222	4	226	-48	-19%	-48	-18%	✓	✓	3.0	3.0	✓	✓
	39	250	482	Newington Rd	S Clerk St	390	13	403	420	11	431	30	9%	28	7%	✓	✓	1.0	1.4	✓	✓
	39	250	70	Newington Rd	East Preston St	140	2	142	220	4	224	80	63%	82	58%	✓	✓	5.6	6.1	×	×
	39	250	68	Newington Rd	West Preston St	50	2	52	34	0	34	-16	-38%	-18	-35%	✓	✓	1.6	2.7	✓	✓
	39	66	482	West Preston St	S Clerk St	30	1	31	12	3	15	-18	-69%	-16	-52%	✓	✓	3.8	3.3	✓	✓
	39	66	70	West Preston St	East Preston St	228	3	231	200	1	201	-28	-13%	-30	-13%	✓	✓	2.2	2.0	✓	✓
	39	66	254	West Preston St	Newington Rd	21	1	22	44	0	44	23	128%	22	100%	✓	✓	4.2	3.8	✓	✓
Cameron Toll																					
	147	30048	30	Dalkeith Rd	Peffermill Rd	144	4	148	171	2	173	27	23%	25	17%	✓	✓	2.9	2.0	✓	✓
	147	30048	30119	Dalkeith Rd	Old Dalkeith Rd	343	2	345	188	4	192	-155	-48%	-153	-44%	×	×	9.9	9.3	×	×
	147	30048	35	Dalkeith Rd	Sharpedale Loan	27	0	27	41	0	41	14	52%	14	52%	✓	✓	2.4	2.4	✓	✓
	147	30048	10	Dalkeith Rd	Lady Rd	233	4	237	144	6	150	-89	-41%	-87	-37%	✓	✓	5.5	6.3	×	×
	147	384	30050	Peffermill Rd	Dalkeith Rd	138	13	151	151	0	151	13	11%	0	0%	✓	✓	1.5	0.0	✓	✓
	147	384	30119	Peffermill Rd	Old Dalkeith Rd	39	5	44	30	0	30	-9	-31%	-14	-32%	✓	✓	0.2	2.3	✓	✓
	147	384	35	Peffermill Rd	Sharpedale Loan	40	2	42	35	1	36	-5	-14%	-6	-14%	✓	✓	0.3	1.0	✓	✓
	147	384	10	Peffermill Rd	Lady Rd	398	17	415	347	19	366	-51	-15%	-49	-12%	✓	✓	1.3	2.5	✓	✓
	147	30054	30050	Old Dalkeith Rd	Dalkeith Rd	340	5	345	293	3	296	-47	-16%	-49	-14%	✓	✓	1.6	2.7	✓	✓
	147	30054	30	Old Dalkeith Rd	Peffermill Rd	151	28	179	127	3	130	-24	-18%	-49	-27%	✓	✓	2.0	3.9	✓	✓

						Observed			Modelled			Difference / % Difference						GEH			
	Node	From	To	From	To	LV	HV	Total	LV	HV	Total	LV	LV %	Total	Total %	LV	Total	LV	Total	LV	Total
	147	803	35	Old Dalkeith Rd	Sharpedale Loan	45	2	47	38	0	38	-7	-17%	-9	-19%	✓	✓	0.6	1.4	✓	✓
	147	30054	10	Old Dalkeith Rd	Lady Rd	274	2	276	225	6	231	-49	-20%	-45	-16%	✓	✓	3.0	2.8	✓	✓
	147	275	30050	Sharpedale Loan	Dalkeith Rd	18	0	18	10	0	10	-8	-53%	-8	-44%	✓	✓	1.4	2.1	✓	✓
	147	275	30	Sharpedale Loan	Peffermill Rd	15	0	15	17	0	17	2	13%	2	13%	✓	✓	0.3	0.5	✓	✓
	147	275	30119	Sharpedale Loan	Old Dalkeith Rd	6	1	7	4	0	4	-2	-33%	-3	-43%	✓	✓	0.9	1.3	✓	✓
	147	275	10	Sharpedale Loan	Lady Rd	5	1	6	0	0	0	-5	-167%	-6	-100%	✓	✓	2.4	3.5	✓	✓
	147	9	30050	Lady Rd	Dalkeith Rd	194	9	203	394	7	401	200	118%	198	98%	×	×	10.8	11.4	×	×
	147	9	30	Lady Rd	Peffermill Rd	328	2	330	247	8	255	-81	-27%	-75	-23%	✓	✓	4.0	4.4	✓	✓
	147	9	30119	Lady Rd	Old Dalkeith Rd	332	11	343	166	4	170	-166	-55%	-173	-50%	×	×	10.9	10.8	×	×
	147	9	35	Lady Rd	Sharpedale Loan	8	0	8	0	0	0	-8	-100%	-8	-100%	✓	✓	4.0	4.0	✓	✓
Lady Rd/ Craigmillar Pk																					
	17	30191	30137	Craigmillar Pk	Lady Rd	155	6	161	178	1	179	23	16%	18	11%	✓	✓	1.4	1.4	✓	✓
	17	30191	30178	Craigmillar Pk	Liberton Rd	325	16	341	248	9	257	-77	-26%	-84	-25%	✓	✓	5.5	4.9	×	✓
	17	30191	181	Craigmillar Pk	Esslemont Rd	11	1	12	13	0	13	2	20%	1	8%	✓	✓	0.9	0.3	✓	✓
	17	30326	30187	Lady Rd	Craigmillar Pk	218	4	222	201	2	203	-17	-10%	-19	-9%	✓	✓	0.7	1.3	✓	✓
	17	30326	30178	Lady Rd	Liberton Rd	222	10	232	204	7	211	-18	-9%	-21	-9%	✓	✓	0.4	1.4	✓	✓
	17	30326	181	Lady Rd	Esslemont Rd	366	4	370	381	19	400	15	5%	30	8%	✓	✓	1.7	1.5	✓	✓
	17	30177	30187	Liberton Rd	Craigmillar Pk	744	22	766	416	11	427	-328	-49%	-339	-44%	×	×	13.5	13.9	×	×
	17	30177	30137	Liberton Rd	Lady Rd	321	15	336	481	6	487	160	55%	151	45%	×	×	6.9	7.4	×	×
	17	30177	181	Liberton Rd	Esslemont Rd	84	0	84	93	1	94	9	11%	10	12%	✓	✓	1.0	1.1	✓	✓
	17	182	30187	Esslemont Rd	Craigmillar Pk	7	1	8	9	0	9	2	29%	1	13%	✓	✓	0.7	0.3	✓	✓
	17	182	30137	Esslemont Rd	Lady Rd	258	2	260	243	10	253	-15	-6%	-7	-3%	✓	✓	0.9	0.4	✓	✓
	17	182	30178	Esslemont Rd	Liberton Rd	26	0	26	17	3	20	-9	-38%	-6	-23%	✓	✓	1.5	1.3	✓	✓