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West Edinburgh Transport Appraisal Refresh

City of Edinburgh Council

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In cooperation with AECOM, ARUP, Mott MacDonald and WSP | Parsons Brinckerhoff

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1. Introduction

1.1 Background

1.1.1 Original WETA 2010 Study

In May 2008, the Scottish Government published the West Edinburgh Planning Framework (WEPF), which set out the long term vision for the area. The West Edinburgh Transport Appraisal (WETA), published in February 2010, was developed as a strategic appraisal of possible transport interventions to support WEPF's implementation.

The WETA study set out a phased approach to how the development might progress which would in turn inform the assessment of potential demand for transport accessibility. Therefore, the approach was taken to develop an interim and full development scenario. The full development scenario was for development 2031 and beyond, with an assessment year of 2031 while the interim scenario was for development up to 2031, with an assessment year of 2021.

The aim of the WETA was to appraise alternative approaches to tackling the transport accessibility requirements set out in the WEPF through following the Scottish Transport Appraisal Guidance (STAG) process. This included following a robust appraisal process consisting of three parts; Pre-Appraisal, Part 1 Appraisal and Part 2 Appraisal. The Pre-Appraisal stage allowed for 6 transport planning objectives to be defined through the assessment and analysis of problems and opportunities. Part 1 Appraisal utilised a mainly qualitative approach to appraising the sifted list of transport policies and interventions emergent from Pre-Appraisal while Part 2 Appraisal employed the use of more quantitative analytical tools.

The geographical extent of the area and complexity of the various issues it faces, along with the scale of the development and its potentially significant impact on the strategic transport network led to transport modelling being used as the core analytical tool for the appraisal. This was important for determining capacity constraints and route choices as well as conducting economic appraisals of design options. Furthermore, in view of the strategic importance of the West Edinburgh area, a process of consultation was followed which allowed key stakeholders to inform and steer the study.

1.1.2 TISWEP

Following the WETA study, changing economic conditions required the developers in the West Edinburgh area to consider reduced levels of development up to 2021. It was considered by some stakeholders that the reduced development activity would not trigger the levels of infrastructure interventions required under WETA and whilst the long term strategy of WETA remained, greater consideration of infrastructure phasing was required.

The subsequent Transport Infrastructure for West Edinburgh Study Phase 1 (TISWEP) study identified what infrastructure interventions were needed to service the additional travel demand associated with the revised development proposals in 2021.

Table 1.1: TISWEP assumed levels of development to 2021

Development		GFA/No.	Units
Airport	Passengers	12,610,000	Pax/Yr
	Employees	4,080	Employees
	Hotels	350	beds
RHC	Hotels	289	beds
	New or refurbished Showground Buildings	13,300	sq m
	New Office Space	18,900	sq m
	Food Centre of Excellence	5,325	sq m
IBG	Hotel	477	beds
	Event Arena	9,600	sq m
	Office	19,510	sq m
	"World Trade Centre"/Offfice	13,935	sq m

The study objective was developed to identify the least cost infrastructure solutions required to support the interim development proposals in 2013, 2017 and 2021. The study area included the major junctions of Newbridge roundabout, Gogar roundabout and the A8 Dumbbells at Eastfield Road.

1.1.3 West Edinburgh Transport Study

The West Edinburgh Transport Study was a follow-on from WETA and TISWEP undertaken for the development clients for IBG Phase 1 but with the involvement of both CEC and Transport Scotland. It identified the traffic and transport implications resulting from the IBG and other developments within the West Edinburgh Strategic Development Area, outlined within the City of Edinburgh Council Second Proposed Local Development Plan.

The report from the study summarises the traffic demand for the study sites; the sustainable travel demand; the impact of the developments on the study network; the mitigation measures required to accommodate the developments and an independent third party costing of the mitigation measures. Modelling was undertaken using the CEC VISUM multi-modal model and also a corridor specific VISSIM microsimulation model. The study included the full projected development of the International Business Gateway Phase 1 site but also known development quantum for adjacent developments including the RHASS showground site. Estimates relating to the projected growth of the Airport were used for this study, based on the information available at the time.

1.2 Setting up of WETA Refresh

1.2.1 Purpose – City Deal and Planning

There were two key reasons for needing to look at a refresh of the original WETA Study:

- City Deal
- Live Planning Applications

City Deal

The City of Edinburgh Council (CEC) along with other local authorities in the wider Edinburgh City Region is keen to ensure that appropriate investment can be made to deliver transportation infrastructure that supports priorities for economic development and skills in the Region. Whilst the studies previously mentioned provided some very relevant background to support this, it was necessary to have a fully up to date study that reflected not only the revised growth projections for IBG 1 and the RHASS showground site but also the emerging proposals for a supplementary phase of IBG and also the plans by Edinburgh Airport for a very significant expansion of their operations. A refreshed version of the original WETA study would help clarify how City Deal could help to unlock constraints to delivering the necessary infrastructure to support the major development and Airport Growth anticipated. It would clarify the most appropriate package of transportation infrastructure and supportive measures needed along with associated costings and phasing to feed into potential funding models within an objectives led approach.

Planning

The original WETA Study along with the subsequent TISWEP and West Edinburgh Transport Studies all sought to provide a key strategic framework for taking forward a comprehensive transportation approach in West Edinburgh to support relevant planning applications as well as the growth of Edinburgh Airport. The West Edinburgh Transport Study mentioned above, was intended to specifically support, at least at a strategic level, the planning application for the first phase of the IBG. There have also been a significant number of other major development proposals moving forward in West Edinburgh. Whilst many were taken into account within the West Edinburgh Study the development of the Eastern Phase of the IBG and the planning application for the East of Milburn Tower sites were not incorporated because of their planning status at that time. There was thus a need for the refresh study to cover the full range of West Edinburgh sites and also look at the impacts of the emerging major growth proposals for the Airport.

At the commencement of the WETA Refresh Study all parties in the West Edinburgh Framework were awaiting the decision from the Scottish Government Reporter on the Local Development Plan (LDP). It was important that the methodology, particularly in terms of the modelling approach, was designed in a way that would enable

subsequent testing of any different land-use scenarios emerging from that decision as well as the core assumptions from LDP.

The decision from the Reporter which has since been released set out a series of recommendations in respect of transportation which have further backed up the approach and scope that had been adopted by CEC with the respective partners as the extracts from the Table of Recommendations in the box below demonstrates:

Transport Assessment (TA)

- Contributions to address the area wide transport interventions, detailed below and as specified through Supplementary Guidance, will be applied through a cumulative contribution zone. Delivery will be monitored and managed through the action programme. The council's approach to secure timeous delivery of the required infrastructure is to be detailed through its Supplementary Guidance.
- Detailed Transport Assessments, where required, should include modelling of the cumulative effect of increased traffic flows on the trunk and local road networks (taking into account all known proposed development and any potential cross-boundary impacts). This should draw on the conclusions of the council's transport appraisal and further work being carried out to assess the wider cumulative and cross-boundary impacts on the trunk road network and should show how mode share targets are to be met.

1.2.2 Governance Structure

West Edinburgh has often been seen as an exemplar in taking forward a co-ordinated, collaborative approach to transportation and wider planning and infrastructure issues. Whilst there can always be tensions between different stakeholders in complex development zones with existing constrained infrastructure, the West Edinburgh Planning Framework published back in 2008 set out a long term vision for the area and promoted collaborative working between the Council, Scottish Enterprise, Transport Scotland, Edinburgh Airport, RHASS and the IBG developers on the critical issue of transportation. The WETA Refresh study has sought to build upon this established co-operation through an innovative collaborative working approach with a unique governance structure.

Jacobs were appointed to lead the study working in collaboration with the consultancy teams of the respective partners namely AECOM (for Edinburgh Airport), WSP | Parsons Brinckerhoff (for IBG Phase 1 and IBG East) and Arup (for RHASS). In addition contact has been made through the study period with the transportation consultancies representing the East of Milburn Tower Development (SWECO), RBS (Modus Transport Solutions) and Fairview Mill (Transport Planning Limited).

The Governance Structure included the following key groups:

1. Transportation Technical Working Group:
- Chaired by Jacobs (Keith Gowenlock)
- WSP | PB, AECOM, Arup and Jacobs
- CEC and TS technical input

2. Transportation Technical Steering Group:
- Chaired by CEC (Ewan Kennedy)
- Jacobs co-ordinate
- Membership Transport Scotland, consultancies, invited specialists

3. West Edinburgh Principals Group (MoU)
- Receive presentations by Jacobs/CEC
- Monitor progress, make key decisions, resourcing

Wider Stakeholder Consultation

In addition to the working groups with the key parties involved with the West Edinburgh Framework, a number of consultation meetings have been held during the study period with other parties. This included sessions with the main bus operators, Lothian Buses and First Bus, meetings with Transport Scotland's Rail Team, West Lothian Council and a number of specialists within CEC. Additional stakeholder consultation was undertaken by the teams working on studies that have input to this collaborative report for example the AECOM A89/ A8 Corridor – Public Transport Improvement Study which included consultation with bus operators, Police Scotland, Fire Scotland, local community councils, SESPLAN, Edinburgh Airport SPOKES and the Royal Bank of Scotland and SESPLAN.

2. Policy/Planning Context

2.1 Policy Background

2.1.1 National Transport Strategy

The National Transport Strategy (NTS), produced by the Scottish Government and published in 2006, and subsequently refreshed in 2016, considers Scotland's transport needs and sets out the medium to long term vision for transport. It sets the framework for the Strategic Transport Project Review (STPR) and will determine the Government's future infrastructure investment. The NTS sets out three key strategic outcomes to be used as the guiding principles and inform the decision making process at national, regional and local level. The three key outcomes are:

- Improved journey times and connections, to tackle congestion and lack of integration and connections in transport;
- Reduced emissions, to tackle climate change, air quality, health improvement; and
- Improved quality, accessibility and affordability, to give choice of public transport, better quality services and value for money, or alternative to car.

2.1.2 Regional Transport Strategy

SEStran's Regional Transport Strategy (RTS) lays out the vision for the strategic development of transport in South East Scotland up to 2025 and includes a particular focus on links to and from Edinburgh, as the economic hub of the region. First produced in 2008, the RTS has undergone a thorough update and refresh which was produced in 2015. The strategy proposed the following key objectives:

- Economy - to ensure transport facilitates economic growth, regional prosperity and vitality in a sustainable manner;
- Accessibility - to improve accessibility for those with limited transport choice (including disabled people) or no access to a car, particularly those who live in rural areas;
- Environment - To ensure that development is achieved in an environmentally sustainable manner; and
- Safety and Health - To promote a healthier and more active SEStran area population.

2.1.3 Local Transport Strategy

The City of Edinburgh Council's (CEC) Local Transport Strategy 2014 – 2019 (LTS) sets out the policies and actions for transport which will be an important contributor towards meeting the CEC's vision. The LTS includes the following objectives in relation to the council's approach to transport in support of transport and economic development policies for Edinburgh:

- To support the economic vitality of the city centre, traditional centres and local shops;
- To support development in the growth areas of the city through facilitating provision of necessary transport infrastructure;
- To help improve quality of life in Edinburgh's residential areas; and
- To minimise the need for car use.

2.2 Planning Background

2.2.1 Local Development Plan (Masterplan led)

The CEC's Second Proposed Action Programme – updated May 2015, which accompanies the Second Proposed Edinburgh Local Development Plan (LDP), set out how the authority proposed to implement their LDP. The Action Programme established actions which would help mitigate the impact of strategic and planned growth and deliver the policies and proposals identified within the proposed plan. The following table summarises the key package of measures within the Action Plan for West Edinburgh.

The LDP was modified (September 2016) and this Refresh Study is intended to inform the preparation of the revised LDP Action Programme and the draft Supplementary Guidance.

3. Revisiting the Objectives

3.1 Refreshed WETA Objectives

The original WETA study set out a number of key Objectives (Planning Objectives) against which the packages of measures were appraised. This objectives-led approach is a key element of the STAG Appraisal guidance under which the original study was prepared. Whilst this Refresh study is not a STAG appraisal, it was felt that given the developments in national, regional and local policy in the intervening period, it was important to review the original objectives to see if any sensible, small revisions should be made to better align them with current thinking but also the outcome-led nature of the City Deal process.

The small changes set out in the table below, along with appropriate changes to indicators, were agreed through the Working and Steering Groups meetings. These changes placed more of an emphasis on supporting growth within the West Edinburgh Planning Framework area as well as further promoting mode shift to more sustainable modes though for example an emphasis on improving journey times for public transport

Table 3.1: Revised WETA objectives

Transport Planning Objectives	SMART indicators	Revised Draft Transport Planning Objectives	Revised SMART indicators
To meet West Edinburgh Planning Framework growth through:		To support West Edinburgh Planning Framework growth through:	
At a local and strategic level, reduce the variability of journey times and improve overall journey times particularly for public transport	Journey time and journey time variability by public transport and highway modes between a series of key points	At a local and strategic level, reduce the variability of journey times and improve overall journey times for public transport	Journey time (for PT) and journey time variability (for PT and highway modes) between a series of key points
To minimise and mitigate environmental impacts on local communities – local air quality; road noise; severance (physical/speed)	a. Noise levels (thresholds) b. Air quality levels (thresholds) c. Severance – assessment of traffic speed and volumes at key locations	To minimise and mitigate environmental impacts on local communities – local air quality; road noise; severance (physical/speed)	a. Noise levels (thresholds) b. Air quality levels (thresholds) c. Severance – assessment of traffic speed and volumes at key locations
To achieve 50% mode share by public transport, walking and cycling [as set out in relevant policy documents]	Modal share for key journeys	To maximise mode share by walking, cycling and public transport (minimum 50% mode share to non-airport development)	Modal share for key (peak) journeys
To improve accessibility to; through and within the area	a. Access for the local community to West Edinburgh developments b. Strategic access to West Edinburgh developments	To improve accessibility to; through and within the area	a. Access for the local community to West Edinburgh developments b. Strategic access to West Edinburgh developments (Catchment populations by mode)
To ensure the transport system has the resilience to handle foreseeable major events and incidents	a. Royal Highland Centre major events b. Major airport incidents	To ensure the transport system has the resilience to handle foreseeable major events and incidents	Monitoring ability to handle major events e.g. RHS events, major airport incidents
To protect and enhance the natural and built environment of the West Edinburgh area as set out in relevant documents	As defined in West Edinburgh Strategic Design Document and other key documents (Scheduled Ancient Monuments, Listed Buildings, NMRS, Floodplains and watercourses, protected species, SINCs, landscape designations, geological, agriculture and soils)	To protect and enhance the natural and built environment of the West Edinburgh area as set out in relevant documents	As defined in relevant policy and guidance e g West Edinburgh Landscape Masterplan, Edinburgh Street Design Guidance, Designing Streets Policy, landscape designations etc

3.2 City Deal Vision and Objectives

The following table sets out how the WETA Refresh Objectives complement and address the wider City Deal Vision and Objective for the City Region as a whole. This demonstrates a strong fit between the two sets of objectives, not only in terms of the obvious overlap (i.e. providing new infrastructure to unlock key development sites) but also in terms of less obvious connections. As an example, new approaches to support people excluded from the labour market could be supported through improvements to public transport opening up access to people living in housing areas with current poor levels of accessibility to the key employment areas in West Edinburgh.

Table 3.2: City Deal Vision and Objectives and WETA Refresh Objectives and Proposed Measures

City Deal Vision and Objectives	Relevant WETA Refresh Objectives	SMART Indicators
Vision: Accelerating the rate of investment and economic performance by capitalising on our world class assets through an inclusive and sustainable growth model.	Overall Objective: To support West Edinburgh Planning Framework growth	See specific indicators below
An integrated range of interventions to accelerate the rate of business growth across the region.	Overall Objective: To support West Edinburgh Planning Framework growth	See specific indicators below
New approaches to support people excluded from the labour market	Specific Objective: To improve accessibility to; through and within the area	Access for the local community to West Edinburgh developments b. Strategic access to West Edinburgh developments (Catchment populations by mode) TRACC Accessibility Modelling, VISUM outputs
A series of development propositions for innovation hubs across the region	Specific Objective: To improve accessibility to; through and within the area	
New infrastructure to unlock key development sites which either contribute to major sectoral growth, or deliver housing development at scale at strategic development sites – and for this infrastructure to encourage sustainable travel across a connected region wherever possible	Overall objective - To support meet West Edinburgh Planning Framework growth Specific Objective: At a local and strategic level, reduce the variability of journey times and improve overall journey times particularly for public transport Specific Objective: To maximise mode share by walking, cycling and public transport (minimum 50% mode share to non-airport development) Specific Objective: To improve accessibility to; through and within the area	Journey time (for PT) and journey time variability (for PT and highway modes) between a series of key points Modal share for key (peak) journeys (census, travel surveys, ATC Monitoring against base and model) Access for the local community to West Edinburgh developments b. Strategic access to West Edinburgh developments (Catchment populations by mode) e.g. TRACC analysis, VISUM Model
Investment mechanisms built on forward funding with the risk of return shared across local partners, based on evaluated GVA impact and uplifts in values.	No direct link with objectives and measures but appears compatible with West Edinburgh Framework approach on funding infrastructure.	
A bold approach to deliver our ambitions of a globally recognised smart region;	Overall Objective: To support West Edinburgh Planning Framework growth	
Innovative measures to strengthen further our cultural offer and address its sustainability for the future;		
And a new approach to governance and policy integration which will bring together strategic planning functions for the region under a new cross sector partnership based model.	The WETA Refresh Study adopted an innovative, collaborative model across a range of clients and stakeholders which fits well with this objective.	

4. Developing the Travel Demand Picture

4.1 Introduction

Development travel demands have been derived from available Transport Assessments for all major development proposals. A full summary of references for each is given in Appendix A.

In assessing transport impacts, a central 2030 forecast has been adopted. Sensitivity testing has then been undertaken for a 2040 forecast year, focussing on the impact of the airport.

4.2 Airport Forecasts

Edinburgh Airport has provided a comprehensive assessment of forecast passenger and staff numbers from 2015 to 2030 and 2040, as summarised in Table 4.1.

Table 4.1: Edinburgh Airport passenger forecasts

Year	Forecast passengers per annum
Actual 2015	11,131,000
Forecast 2030	20,746,000
Forecast 2040	27,880,000

Data has been provided for two markets;

- originating UK (travel originating from Edinburgh, the local and Scottish travel market)
- other end UK and international (originating rest of UK and international travel market

It has been further disaggregated by mode, including, car / car passenger, rental car, taxi, bus and tram.

4.3 IBG West

The International Business Gateway (IBG) development will be undertaken in phases and the first phase is intended to include:

- 122,000sqm Class 4 business;
- Hotels (1,415 rooms);
- 800sqm leisure development;
- 5,400sqm Retail/food and drink development; and
- Residential (312 flats/apartments).

4.4 IBG East

IBG East consists of the following land uses:

- 118,000sqm Class 4 business;
- Hotel (250 rooms);
- 1,966 Mixed dwellings consisting of 1,497 flat/apartments and 469 houses;
- Retail/Leisure development; and
- Primary school and potential land for a secondary school.

4.5 RHASS Showground

Current development proposals at the Royal Highland and Agricultural Society of Scotland showground are less certain, as projects are generally being brought forward by independent third parties. As a result, assumed

development has been based upon the previous 2010 masterplan transport assessment, prepared in support of a subsequently approved Planning Permission in Principal application.

Development includes:

- New or extended showground buildings 13,370sqm
- 29,000sqm office space
- 2 new hotels, a food centre of excellence and conference facilities 3

4.6 RBS

The Royal Bank of Scotland is in the process of rationalising their office space in Edinburgh. Their Dundas St building is to close, there will be some rationalisation of the Younger Building while staff numbers at Drummond House and Gogarburn will increase.

At Gogarburn the total number of based workers is expected to increase to 6,000. Of these, 4,700 will be working in the building at any one time, an increase of 1,200 over current numbers.

Approximately 300 new parking spaces are proposed, giving a total provision of 1,700.

4.7 Other Developments - Cammo, Maybury, West Craigs, Garden District Phase 1 etc

Other developments included in the model are:

- Cammo 650 houses
- West Craigs (Taylor Wimpey) 250 houses
- West Craigs 1,350 houses
- East of Millburn Tower 1,500 houses
- Ratho Station 130 houses
- Fairview Mill 13,667sqm office, plus pub / restaurant and hotel
- Turnhouse Mixed industrial
- Airport hotels Hampton and Moxy

In consultation with CEC, it has been assumed that a further 100,000sqm of office space will be developed at Edinburgh Park. Approximately 50% will be complete 2025 with 75% complete by 2030. It is acknowledged that it is unlikely that the scheme will proceed in this form. The Local Development Plan now promotes a mix of uses and a revised level of office floor space has not yet been estimated.

A proposed mixed use development to the west of the tram depot has been excluded from the analysis at this stage. Although a PAN has been submitted, no information is currently available on the make-up of the development.

4.8 Summary of Demand Profiles

Table 4.2 summarises the major developments in West Edinburgh, estimated trip rates from each transport assessment and likely completion levels by 2020 and 2030.

Table 4.2: Summary of development projections (vehicle trips)

Zone	Development	Comment		By 2020				By 2030			
	unit			08:00-09:00		17:00-18:00		08:00-09:00		17:00-18:00	
				arr	dep	arr	dep	arr	dep	arr	dep
225	Edinburgh Park Phase 2	100,000sqm office, 75% by 2030		Demand derived from model							
229	Royal Bank of Scotland	increase from 3500 to 4700 staff		Demand derived from model							
238	Ratho Station	130 units by 2030						11	46	46	11
2261	E of Milburn Tower	750 units by 2020, 1500 by 2024		66	263	263	66	132	526	526	132
2301	IBG Phase 1	122000m2 office business	Business	373	68	41	319	373	68	41	319
		312 units	Residential	14	37	42	15	14	37	42	15
		1415 beds	Hotel	67	67	58	28	67	67	58	28
2301	Total			454	172	141	362	454	172	141	362
2302	IBG Phase 2	118,000m2 office / business	Employment	0	0	0	0	351	62	46	320
		1966 units	Residential	0	0	0	0	71	252	167	95
2302	Total			0	0	0	0	422	314	213	415
2303	West of Tram Depot	mixed use - no details available									
2321	Turnhouse	office 3291m2	Office	0	0	0	0	71	10	18	66
		light industrial 16550 m2	Light industrial	0	0	0	0	71	30	34	66
2321	Total			0	0	0	0	142	40	52	132
2322	Cammo	200 units by 2020, rest by 2030		14	50	47	27	47	161	154	87
2323	West Craigs	0 units by 2020, rest by 2030		0	0	0	0	65	356	243	135
2324	West Craigs (TW)	250 units by 2020		34	176	123	68	12	66	45	25
2401	RHASS	showground building excluded		59	17	28	78	118	33	55	156
2402	Airport Hotel (Hampton)	175 beds		35	89	84	36	35	89	84	36
2402	Airport Hotel (Moxy)	213 beds		47	55	56	35	47	55	56	35
2402	Fairview Mill	180 beds	Hotel	53	45	34	21	53	45	34	21
			Pub / restaurant	0	0	14	10	0	0	14	10
		13,667sqm office, complete by 2021	Employment	210	30	23	170	210	30	23	170
2402	Total			345	219	211	272	345	219	211	272

5. Meeting Future Demand

5.1 The WETA 2010 Recommended Package

The WETA study developed five separate access strategies which were formed of a range of infrastructure measures, which would be subsequently tested and appraised. Three access strategies were developed for the full development scenario whilst two were developed for the interim scenario. Strategy 4c emerged from the study as performing most strongly against the planning objectives and wider STAG criteria and was subsequently adopted by CEC as the basis for the relevant LDP Action Plans.

"Strategy 4c: Access strategy against full development scenario (2031) with 50% Mode Share Target (MST) for travel by sustainable modes delivered through strategic public transport schemes and core sustainability package, Full Gogar Link, capacity enhancements on A8, Eastfield Road, Dumbbells, Newbridge and Gogar junctions (Gogar Link only)"

5.2 Transportation Updates since WETA 2010

5.2.1 Pedestrian

This refresh study is focused on strategic movements to and from the West Edinburgh area and for this reason has not specifically addressed walking movements as a mode in its own right. However, the key role of walking in providing access to and from other modes of transport such as bus and tram is seen as critical and all the transport infrastructure measures considered in this Refresh study have taken this into account for example through the incorporation of appropriate crossing facilities and high quality footpaths. In addition, many of the cycling measures proposed allow for joint use by pedestrians or incorporate improvements to facilities to benefit those walking. The additional and improved interchanges and park and ride sites proposed assume best practice design approaches are adopted including excellent accessibility for pedestrians supported by barrier free design for people with mobility difficulties. Finally, the emerging masterplans for development within the West Edinburgh area must adopt the key principles of street design set out in the Scottish Government Policy Designing Streets and CEC's own Street Design Guidance and West Edinburgh Landscape Masterplan.

5.2.2 Cycling

Opening up improved opportunities for cycling to and from West Edinburgh is an important dimension of this Refresh Study. This section summarises current provision in the area, the position taken by the original WETA study and more recent policy and infrastructure developments that further reinforce the importance of catering for this growing mode of travel.

Existing Cycling Infrastructure the WEPF Area

Immediately adjacent to the proposed IBG site, shared cycle/footpaths exist on both sides of the A8 dual carriageway, though there is a sizeable gap on the north side of the roadway between Gogarburn and Eastfield Road. The southern side pathway along the A8 is narrow and in poor condition from Station Road toward the M9, before disappearing entirely near the M9. Desire lines indicate that individuals access this area regardless of the presence of a pathway, likely to cross the M9 by way of the Newbridge Roundabout. The Ratho Station Bridge over the A8 at Station Road is not cycle friendly or generally accessible, as it includes steps.

The north side A8 path connects to the A89 and points west via a high quality bicycle and pedestrian bridge over the M9. The shared cycle footpath continues along the north side of the A89 to the Kilpunt Roundabout near Broxburn.

Crossings at roundabout locations pose difficulties for cyclists, particularly at the Gogar Roundabout where non-motorized users must negotiate multiple lanes to cross – as many as four at a time. This is a critical junction as it is the access point through which traffic must pass leading to and from the proposed IBG site from established residential areas of West Edinburgh, the Gyle Shopping Centre and adjacent neighbourhoods.

Other roundabouts pose similar difficulties, though not of the same volume and scale of the Gogar Roundabout. At the Eastfield Road interchange, many crossing points from both the north and south sides of the A8 are uncontrolled. At the Newbridge Roundabout, there is an uncontrolled crossing approximately 260m west of the

roundabout from the south side of the A89 to the north, where the cycle and pedestrian bridge over the M9 is located. East of the Newbridge Roundabout, desire lines along the south side of the A8 indicate that individuals are accessing the southern edge of the roundabout to cross the M9, with no dropped kerbs or signal improvements assisting this movement.

A shared cycle footpath connects the north east quadrant of the Newbridge Roundabout to Dalmeny via Kirkliston. This is narrow and in poor condition in places. In Dalmeny, an off road cyclepath continues to Queensferry and the Forth Road Bridge, including connections to National Cycle Route 1 at Main Street.

Many shared cycle footpaths exist in the vicinity of the Gyle Shopping Centre and Edinburgh Park. These provide access to the north where the Gogar Roundabout and A89 are situated.

Quiet Route 9 has been routed from Roseburn to Newbridge, following the A8 pathway and passing through low-volume streets in the East Craigs and Corstorphine neighbourhoods and pathways through The Gyle Park.

Cycle infrastructure is being integrated into the construction of Edinburgh Gateway Station, located close to the Gogar Roundabout. The station will include secure, sheltered parking for 100 bicycles, five cycle lockers, station lifts large enough to accommodate bicycles (including access between the tram station and rail platforms) and an underpass connecting the station to the Gyle Shopping Centre.

West Edinburgh Transport Appraisal (2010)

The West Edinburgh Transportation Appraisal (WETA) recommended three cycling initiatives as part of its *active travel package*:

- Traffic-free cycle route from the airport/IBG to other areas of West Edinburgh and the A89 corridor
- Cycle routes between developments in the West Edinburgh Planning Framework area
- General improved cycling access, routes and cycle facilities

The WETA also called for a more integrated cycle network with strategic links to the wider network, Edinburgh city centre and more widely to the Lothians and Fife. WETA also noted enhancing access to the Gogar interchange and better integration between cycling and public transportation within Edinburgh.

Edinburgh Local Transport Strategy (2016-2019)

The Local Transport Strategy sets out the transport policies and actions for the next five years. It aligns with national and regional strategies, and sits above the Edinburgh Council's transport-related Action Plans. This identifies a 10 percent cycling mode share target by 2020, with a 15% target for journeys to work.

Several policies aim to improve cycling infrastructure:

- Walk6 – to seek contributions from developers toward bicycle and pedestrian links across nearby features that would otherwise reduce the accessibility of the site on foot (or by bicycle), as well as contributions for facilities at junctions or paths likely to be used by pedestrians or cyclists accessing the new site
- Pcycle2 – All main road construction is presumed to incorporate cycle lanes or physically segregated cycle infrastructure, with the exception of 20 mph routes
- Pcycle5 – Traffic signals are to replace roundabouts when feasible
- Pcycle7 – Safe provision for cyclists on streets used by trams and secure parking for bicycles near tram stops
- Pcycle8 – Cycle paths shared with footways will only be considered where they are necessary to provide cyclists with a reasonably safe route separated from busy traffic, and they form a component in a longer cycle route
- Existing Cycling-Related Policy

Edinburgh Active Travel Action Plan (2016 Refresh)

Edinburgh has adopted the goal to "make Edinburgh's transport system one of the most environmentally friendly, healthiest and most accessible in northern Europe." The Active Travel Action Plan identifies a practical set of actions aimed at increasing the levels of walking and cycling in Edinburgh.

It identifies a number of relevant routes recently upgraded and others planned for future work. A number of these are close to the West Edinburgh, including:

- Quiet Route 9 – recently upgraded and signed
- National Cycle Network 754 (Union Canal) – recent upgrades with Roseburn to Union Canal Quiet Route (planned 2017-2020).
- Roseburn to Edinburgh Park and Gyle Upgrades (2017-2020)

SESTran Strategic Cross-Boundary Cycle Development Report (2015)

Recommendations from the Strategic Cross-Boundary Cycle Development Report for the WEPF area and its environs are mainly centred on the A8/A89 corridor. Relevant recommendations from the report include:

- Leaving airport roundabout (Eastfield Road) uncontrolled for the time being, but evaluating this and providing control if required in the future
- Provide safe cycling access from the A8 to the Edinburgh Airport terminal
- Review Gogar Roundabout to see if signal timings could provide for pedestrian and cycle access (short term measure)
- Future bridge over A8 at Gogar Roundabout (long-term, high-cost aspiration)

Key missing cycle links identified in the report include:

- A8 to Airport
- A8 to NCR-1 via Maybury Road
- Dalmeny to Newbridge Rail Path (widening and surface upgrade)
- Uncontrolled crossings at Airport Roundabouts, Gogar Roundabout

CEC A89/A8 Corridor – Public Transport Improvement Study (January 2016)

This study reviewed existing conditions and provided recommendations along the A89/A8 corridor from the Kilpunt Roundabout in Broxburn and Maybury Road junction in Edinburgh. Whilst the main concentration of the study was on bus priority it also identified a number of measures required to enhance active travel along the corridor.

Key recommendations relating to cycling include:

- Upgrade of all shared use paths to a minimum 3m, plus clearance
- Clear obstructions from paths
- Consider adding additional width and fully-segregated two-way cycling
- Review all access routes for pedestrian/bicyclist priority
- Comprehensive signing and marking review/plan
- Improvements to Ratho Station Bridge (wheeling channels, other improvements)
- Improved connections through Maybury and Gogar junctions in all directions
- Consider cycle parking at bus stops to promote bike-and-ride journeys

5.2.3 Bus

Existing bus services between settlements in West Lothian and Edinburgh generally converge at Newbridge, to the west of Edinburgh, and enter the city via the A89 and A8 corridor, passing close to proposed development sites and the airport in West Edinburgh. The regular Citylink coach service from Glasgow also uses this corridor to access the city. A small number of services from West Lothian use the A71 to the south, passing the existing Park and Ride site at Hermiston. Most West Lothian services in the area are operated by First Bus.

Lothian Buses operate an extensive network of services across the City of Edinburgh, with frequent services passing through the city centre terminating at a number of locations to the west, including Balerno, Riccarton

(Heriot Watt University), Gogarburn (Royal Bank of Scotland), the Gyle shopping centre, Edinburgh Airport and East Craigs. Lothian Buses also operate less frequent bus services that connect Riccarton to South Queensferry and Slateford to Ratho. Both of these services use the A8 corridor.

Edinburgh airport is served directly by regular bus services from the Halbeath and Ferrytoll Park and ride sites in Fife and from Glasgow city centre, as well as frequent services to Edinburgh city centre and Ocean Terminal in Leith.

Current accessibility by bus services to (and from) the West Edinburgh area is clearly demonstrated by the attached accessibility modelling output prepared using specialist modelling software TRACC. This includes all the current registered bus services operating in the Edinburgh City Region area and has been used to calculate and illustrate journey times to West Edinburgh in 10 minute time bands. It illustrates a good level of accessibility in overall terms by bus services to (and thus from as well) the West Edinburgh area although as a later section will explore, with a number of significant gaps in accessibility that this refresh study has sought to address.

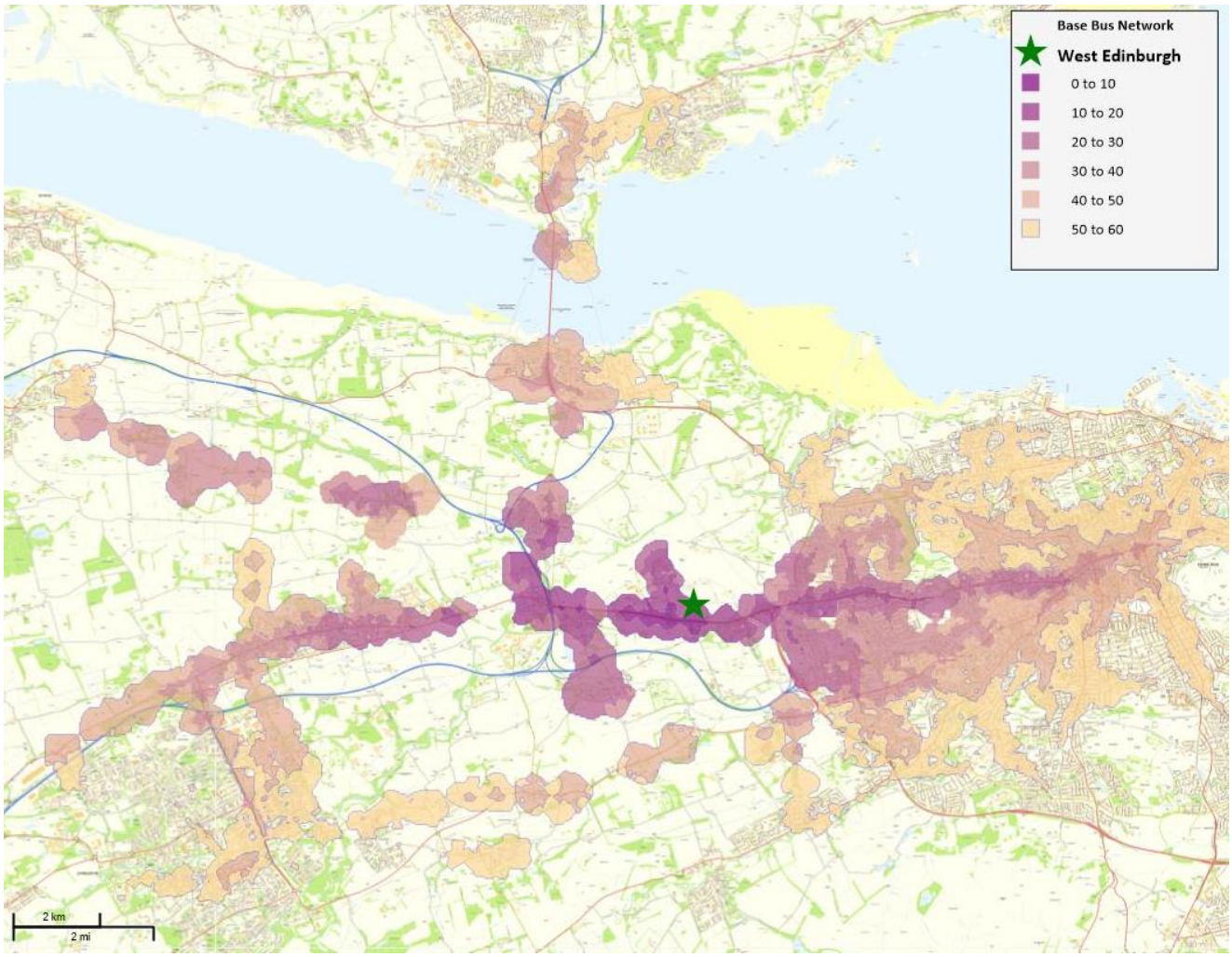

Figure 5.1: Bus access to West Edinburgh (minutes)

5.2.4 Tram

Edinburgh Trams commenced operation on 31 May 2014. Since then, passenger numbers have increased in line with forecasts with 5.3 million passengers using the tram in the last year.

Trams operate from 05:00 to 23:30 between Edinburgh Airport and York Place. The weekday Peak period frequency is 8 trams per hour with 6 trams per hour operating in the weekday interpeak and on Saturday. Three extra return journeys are now provided each morning and evening to cater for peak within peak demand.

End to end journey times vary between 39 and 43 minutes. On and off-street timetable improvements are being developed which will improve performance with journey time reductions and further service frequency increases being proposed.

An end-to-end journey time of less than 37 minutes is easily achievable throughout the working day. A day time frequency of 7.5 minutes is also proposed with a small number of peak services continuing.

Edinburgh trams will stop at Edinburgh Gateway station from December 2016, providing a step change in connectivity between Fife rail services and Edinburgh Airport.

5.2.5 Rail

Rail services provide a very important mode of access to the West Edinburgh area with significant enhancements having been delivered since the original WETA Study. The introduction of the tram service has provided a number of potential interchange options from Edinburgh Park Station (for services from West Lothian and further afield) to and from the airport and other West Edinburgh tram stops. The construction of the new Edinburgh Gateway Station on the line from Fife between South Gyle and Dalmeny, scheduled for opening in December 2016, will provide significantly enhanced rail accessibility to and from West Edinburgh as well as fast and convenient interchange between rail and tram at this location and facilities for interchange with bus and cycle.

There are also several wider network improvements which could have some positive impacts on rail accessibility to and from West Edinburgh. The opening of the Borders Rail line provides wider opportunities for rail travel to and from West Edinburgh with the future potential of hourly through trains serving Edinburgh Gateway Station. The Edinburgh to Glasgow Improvement Project (EGIP) which will deliver full electrification of the route via Falkirk High and an all-electric fleet by the end of 2017 and also electrification of the Stirling, Alloa, Dunblane service (planned for 2018). should improve journey times and journey time reliability on these routes with some benefits for passengers transferring to and from West Edinburgh via Tram at Edinburgh Park Station.

As part of the Long Term Planning Process, the draft Scotland Route Study (SRS) published by Network Rail sets out potential options to be taken forward in Control Period 5 (2014-2019), CP6 (2019-2024) and CP7 (2024-2029) whilst ultimately planning a 2043 Indicative Train Service Specification (ITSS).

The most relevant Scotland Route Study proposals that could improve rail accessibility for West Edinburgh are:

Fife by-pass line: construction of a new section of railway running close to the M90 for approximately five miles. New junctions will be required, one between Inverkeithing and Dalgety Bay, and another in the vicinity of Halbeath Level Crossing. Related works are likely to be required in the Cowdenbeath area for higher line speeds and an upgrade of Thornton North Junction to accommodate the revised routing of interurban traffic. This is intended to address capacity issues between Inverkeithing and Haymarket where additional services will be required to accommodate forecast demand and Scottish Government aspirations for faster train services between Edinburgh and Aberdeen / Inverness. This could benefit West Edinburgh through faster services to and from Fife and further North, particularly if an increasing proportion of these services stop at Edinburgh Gateway.

Winchburgh Junction grade separation and Almond junction: grade separation of Winchburgh junction and the creation of a chord line and grade separated junction known as the Almond Chord, to connect the Winchburgh and Fife lines towards Edinburgh. The new junctions and section of the line between Winchburgh and Haymarket would be electrified. This would reduce crossing movements in the congested Haymarket and Princes Street Gardens area, provide an alternative route avoiding Newbridge Junction, minimise the timetable impacts of a potential new station at Winchburgh and offers the opportunity for selected Edinburgh / Glasgow services to call at the new Edinburgh Gateway railway station.

The above proposals, taken together, further improve rail related accessibility to and from West Edinburgh providing convenient access and much improved interchange with other public transport modes, particularly for journeys from Fife and the northern parts of West Lothian but increasingly from a wider area of the City Region. Network Rail and ScotRail (the ScotRail Alliance) are already progressing significant developments and, for this reason, no further rail measures are being promoted in this Refresh Study.

5.2.6 Road

The local road network around West Edinburgh is largely unaltered since 2010. MOVA[1] has recently been installed at Newbridge roundabout and this has improved junction performance. Safety improvements on Maybury Road and minor junction changes at Barnton are amongst the other smaller scale improvements implemented.

By contrast, trunk road investment has been significant with work continuing on the Queensferry Crossing, now scheduled to open in summer 2017. As part of this scheme, new north facing slips have been constructed at the M9 / M90 Junction 1. Intelligent Transport System (ITS) has also been implemented on the existing Forth Road Bridge approach roads include the M9 and A90/M90.

5.3 Parking Control and Demand Management

5.3.1 Background

If proposed development in West Edinburgh is to achieve a high public transport and active travel mode share, it is vital to consider both measures that make these modes more attractive and also interventions that actively deter car use. Parking control and other demand management measures are an important element of relevant local, regional and national policies and will be critical in promoting sustainable travel behaviour in West Edinburgh area.

Strong parking controls are an important element of the masterplanning philosophy for a number of the key development areas within West Edinburgh. The location of Edinburgh airport within the area is an additional and important consideration in determining the types of control appropriate to the area and how these might be most appropriately implemented.

This section examines the parking control measures which will be needed to help achieve the mode share target (MST) whilst still ensuring that the level of parking provision proposed within the development sites is adequate.

Discussed below are a number of potential parking controls which might be relevant to the West Edinburgh area.

5.3.2 Traffic Regulation Orders / Uncontrolled

Traffic Regulation Orders (TROs) are the most common method of controlling on street parking; they allow for specific locations, durations and the type of vehicle allowed to park in a particular area to be identified and are very flexible.

One of the main benefits of using TROs is that they are easy to implement and enable the road authority to specify a wide range of parking and loading restrictions. A Designation Order would be required to enable charges at parking locations within a CPZ and this would need to be contained in the TRO covering the area. Nevertheless, associated parking income is required in order to enable a level of enforcement sufficient to ensure the success of a scheme.

TROs are an important element in an overall strategy of parking control and can be effective in reducing car mode share when implemented in conjunction with improved public transport and walking and cycling provision.

Implementation within West Edinburgh

TROs would be most suited for the commercial areas within the West Edinburgh site and could be used to create controlled parking zones. Time restricted parking on all roads within the commercial areas should be considered.

On-street parking in commercial areas during office hours could be restricted to reduce on street commuter parking during the day (for example 0830-1730) and relaxed at other times to allow for parking for onsite other uses (for example parking for any residential or leisure land uses) helping to mitigate against any overnight parking overspill.

Changes in parking levels throughout the day at nearby locations such as South Gyle, Edinburgh Park, the adjacent park and ride site and at neighbouring existing or planned residential areas would have to be monitored to assess the level of overspill parking taking place during office hours. Additional restrictions could be extended to cover neighbouring areas if necessary. Strong controls and enforcement currently apply to the airport access roads along with premium priced parking, which is expected to deter usage by employees working within the

[1] Microprocessor Optimised Vehicle Actuation

development site. Similar high levels of enforcement also apply to RBS Gogarburn and indeed in many of the office car parks in Edinburgh Park, which should significantly deter overspill parking in these locations but again this should be monitored. Overspill in these and neighbouring residential areas should be carefully monitored and additional controls introduced as appropriate.

5.3.3 Barrier Controlled Car Parks

Barrier controlled access into car parks has the potential to offer a high level of control over parking areas. Applying parking costs is not necessarily the only control; technologies such as Automatic Number Plate Recognition (ANPR), employing attendants or using a pre-shared code could be used to control access to appropriate car parks for specific groups or individuals only.

The key component of the success of a barrier controlled car park will be deciding upon who will be allowed access. It could be that permission to use the car park is given to those people driving vehicles with smaller engines / are producing lower emissions, people who car pool or those with extenuating personal reasons (and may require a car parking space) for example.

As part of the Travel Plan for each development, careful consideration will be required in deciding how access to parking areas is regulated; with commercial car parks under private ownership (i.e. outside the adopted road limits), success of the scheme may require either a Section 75 or 69 legal agreement.

In summary, using barriers to control access and manage commercial parking on site has a high potential to reduce the car mode share. Nevertheless, the success of barrier controlled parking will be entirely down to any third party management as well enforcement action by the Roads Authority to eliminate / reduce overspill parking.

Ideally, car parks should be adopted, maintained and managed by the Roads Authority allowing for revenue collected to be reinvested into enforcement measures.

Implementation within West Edinburgh

Barrier controls could be implemented within West Edinburgh to control access to either individual car parks or to larger defined zones within the site. They would work well if implemented with TROs controlling on street parking to minimise overspill and manage parking.

5.3.4 Pay to Park

Pay to park schemes require minimal infrastructure and resources to implement as well as providing a potential source of income to the car park's managing authority.

Enforcement will be fundamental to the Pay to Park system in effecting a shift in car mode share. Without stringent enforcement; people may choose to park without paying, thereby undermining the system.

An appropriate pricing strategy will also be required to strike a balance between maintaining efficient use of the car park while discouraging unnecessary car use. This may seek to support short stay parking (less than 4 hours) while penalising commuting travel (lengths of stay greater than 7 hours).

If stringent and efficient enforcement action is maintained, together with the intelligent implementation of TROs and an effective pricing strategy, a pay to park system will have a positive influence in supporting a mode shift to more sustainable transport. It represents a relatively low cost solution in terms of implementation and management while providing a sustainable source of revenue necessary to enable active enforcement.

Implementation within West Edinburgh

A pay to park system could be implemented at defined car parks in a similar manner to barrier controlled car parks (as described above).

A key use of a pay to park system in West Edinburgh would be to control visitor parking within selected areas; the system would provide maximum length of stay, cost and capacity that would be acceptable for visitors but prohibitive for use by commuters travelling to the site. Appropriate provision levels for parking for disabled people (blue badge holders) would of course be essential.

As above, this system would require stringent enforcement in order to succeed.

5.3.5 Commercial Permit Parking

Commercial permit parking is a further type of control, most appropriately applied at commercial buildings (i.e. staff parking) where an employer would provide eligible employees access to a defined car park.

For the system to be successful, proper management of the scheme is fundamental; deciding upon how the available spaces are apportioned to the nearby commercial properties and how individual permissions will be managed will be key to the schemes success.

There is a high level of risk associated with having private car parks managed by third parties as it becomes very difficult for the Roads Authority to ensure that proper management of the car park is undertaken.

Physically restricting the number of spaces attributable to each development is the primary mechanism in controlling the number of permits that can be issued. Making use of Section 75 or Section 69 legal agreements during the planning process will be vital in ensuring proper management.

It should be noted that legal agreements, or the burden of managing staff parking, may make commercial premises less attractive to potential tenants. Overall, commercial permit parking has medium potential for reducing car mode share on site but there is a high degree of risk associated with such a scheme.

Implementation within West Edinburgh

Commercial permit parking would be best suited to controlling how defined car parks are used; a method of control (coded entry / ANPR as discussed in barrier controlled car parks above) would have to be defined and agreed between the buildings tenants and the Local Authority. This should be accompanied by a requirement to development a detailed Travel Plan.

5.3.6 Residential Permit Parking (Controlled or Restricted Parking Zones)

Residential permits have already been successfully employed within Edinburgh City; parking for high density housing is controlled by a zoned parking system that controls where and when resident parking is prioritised.

Permits are bought by residents for a nominal cost from the roads authority and provide a source of revenue that could potentially be re-invested in parking enforcement.

Managed properly, residential permit parking has the potential to provide stringent control over how parking is utilised within housing areas of the development. However, as evidenced from elsewhere in the city shows, there is a high potential for overspill parking to occur. When no parking spaces are available within the residents zone, car owners have little choice but to park on the periphery and walk to their final destination. Schemes have the potential to relocate parking pressure to local streets directly outside the residents parking zone area.

Enforcement and management by the Local Authority is fundamental and the extent of each controlled area must be carefully assessed to ensure the success of the scheme.

From consultation with the City of Edinburgh Council, it is proposed that the area shown in Figure 5.2 below (highlighted by the dark blue boundary) will be included in a restricted parking zone once the developments come on line.

Future consideration could also be given to the East and West Craigs areas; with IBG and Edinburgh Gateway in place, pedestrian links between East Craigs / West Craigs and IBG will be improved. This could create an opportunity for IBG / Edinburgh Gateway traffic to park in these areas with the last leg of the trip to IBG made on foot.

Parking demand would be monitored with the likelihood that the East Craigs and West Craigs CPZ areas would be implemented as wider development necessitates. Further expansion into areas such as North / South Gyle, Broomhall and the remainder of Edinburgh Park may be required as demand necessitates.

In addition, consideration could be given at a future date to expand the zone to include parts of the RHASS site, to the west of Eastfield Rd and south of the A8, towards Newbridge. These areas would encompass new development and minimise the risk of any overspill parking.

Overall, residential permit parking has the potential to help manage the demand for car ownership, allowing car mode share to be tackled in tandem with the promotion of alternative sustainable modes of transport. This would

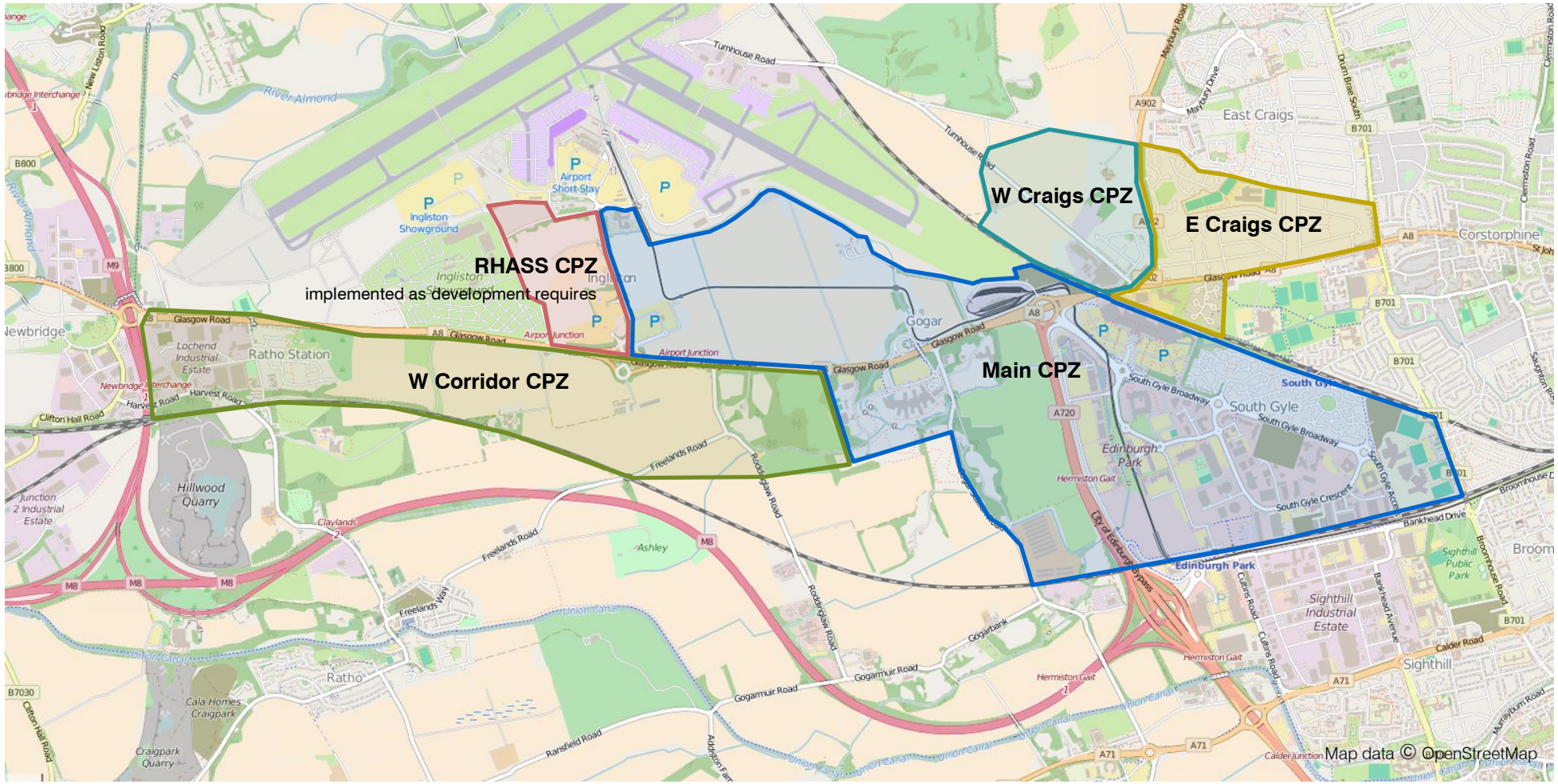

Figure 5.2: Suggested controlled parking zones within West Edinburgh

also provide some revenue that could be reinvested in parking enforcement or in more sustainable means of travel to and from the site.

Implementation within West Edinburgh

The success of a permit parking scheme in West Edinburgh in reducing car mode share would rely largely upon limiting the level of off street parking provision (i.e. garages, driveways, undercroft parking etc.) provided by each development. This will need to be strongly enforced through the planning process.

There is scope to tune parking levels to the specific characteristics of each development site. For example, limited residents parking could be provided for properties in close proximity to tram or bus stops with more parking provided in areas further from public transport. This would require very careful enforcement.

As noted above, in implementing a residents parking scheme, overspill parking may become an issue and so consideration should be given to extending the control zone to cover existing residential areas in West Edinburgh.

5.3.7 Summary

The types of controls described above all have the potential to help reduce the reliance on private car for travel to and from the site. However, any of these schemes, implemented on their own, will fail to have the necessary impact in reducing mode share. A comprehensive package of controls, listed above, combined with a strong monitoring and enforcement regime will be essential in promoting sustainable travel by public transport and active modes.

It may be appropriate to develop and agree revised parking standards for West Edinburgh, reinforcing the parking constraint and demand management approach, which is such a key element of the overall transport strategy.

An important issue with any parking control will be how to control overspill parking on-site and elsewhere. Steps should be taken to monitor overspill, particularly where this occurs off-site. As an example, it will be important to ensure that there are no detrimental impacts on the operation of Ingliston Park and Ride.

Ideally, the local authority should take responsibility for the monitoring, management and enforcement of parking controls as relying on one or multiple independent third parties may lead to conflicting controls and operation.

More generally, CEC will be required to commit a substantial level of resources (staff time, loss in revenue, additional maintenance costs etc.) to parking enforcement for any scheme to be a success. In time, the development itself will generate new revenue for the Council and, depending on the scheme implemented, there may also be scope for the Local Authority to generate specific parking related revenue and thus recoup some, if not all, of these costs. Nevertheless, the issue of any potential short-term revenue shortfall may need to be addressed through the development process.

6. The Emerging Refreshed Package

6.1 Introduction

A wide ranging package of measures has been developed, assessed and costed for this Refresh study and discussed at the various Working and Steering Groups. A number of these measures emerged from the original WETA work and the subsequent TISWEP study, with others coming from the more recent West Edinburgh Transport Study undertaken by WSP | PB and the A89/A8 Corridor Study undertaken by AECOM. Additional measures have been developed by the study team itself, informed by meetings with key stakeholders, for example with CEC and West Lothian officers and with bus operators.

6.2 Cycling

The following projects are recommended as part of a package to enhance cycling in the West Edinburgh area, connecting existing communities and future developments near Edinburgh Airport, whilst also integrating the airport itself into local and regional cycle infrastructure. These have been developed building from the relevant policies and studies referred to in the earlier cycling section and following very useful discussions with appropriate officers within CEC and West Lothian Council and the Working and Steering Groups.

6.2.1 Cycle paths

Off-Street

- Fill gaps along the A8 between Gogar and Newbridge Roundabouts, on both sides of the road
- Path from Newbridge Roundabout north to Kirkliston and towards Dalmeny
  - Widen and repave; improve level crossings with high quality dropped kerbs and roadway markings; remove any impediments in the pathways
- Improvement of pathways and/or on-street lanes in Newbridge to access A89
- Cycle connection from A8 to Edinburgh Airport
- New pedestrian / cycle bridge over Edinburgh – Aberdeen railway line linking West Craigs and Edinburgh Gateway station / The Gyle
- Segregated cycle lane between Gogar and Airport included as part of new link road

On-Street or Off-Street

- Improved access from East Craigs area to A8 cycle paths
- Newbridge-Dalmeny Cycle Path – Associated road or pathway improvements to provide a quality connection from the north end of this pathway to Queensferry cycle network
- Newbridge-Dalmeny Cycle Path – Access to this pathway from Kirkliston along Main Street / Sterling Road or Station Road / Station Terrace
- Improved access between Ratho Station and A8 along Station Road (designated cycle route)
- Improved access between Station Road and Harvest Road along Harvest Drive / Queen Anne Drive (designated cycle route)

6.2.2 Crossings / Junctions

- Gogar Roundabout - improved crossings for bicycles and pedestrians at multiple locations
- Improved crossings at Turnhouse Road and Maybury Road for designated cycle path
- New at grade toucan crossing at A8/Station Road, Ratho

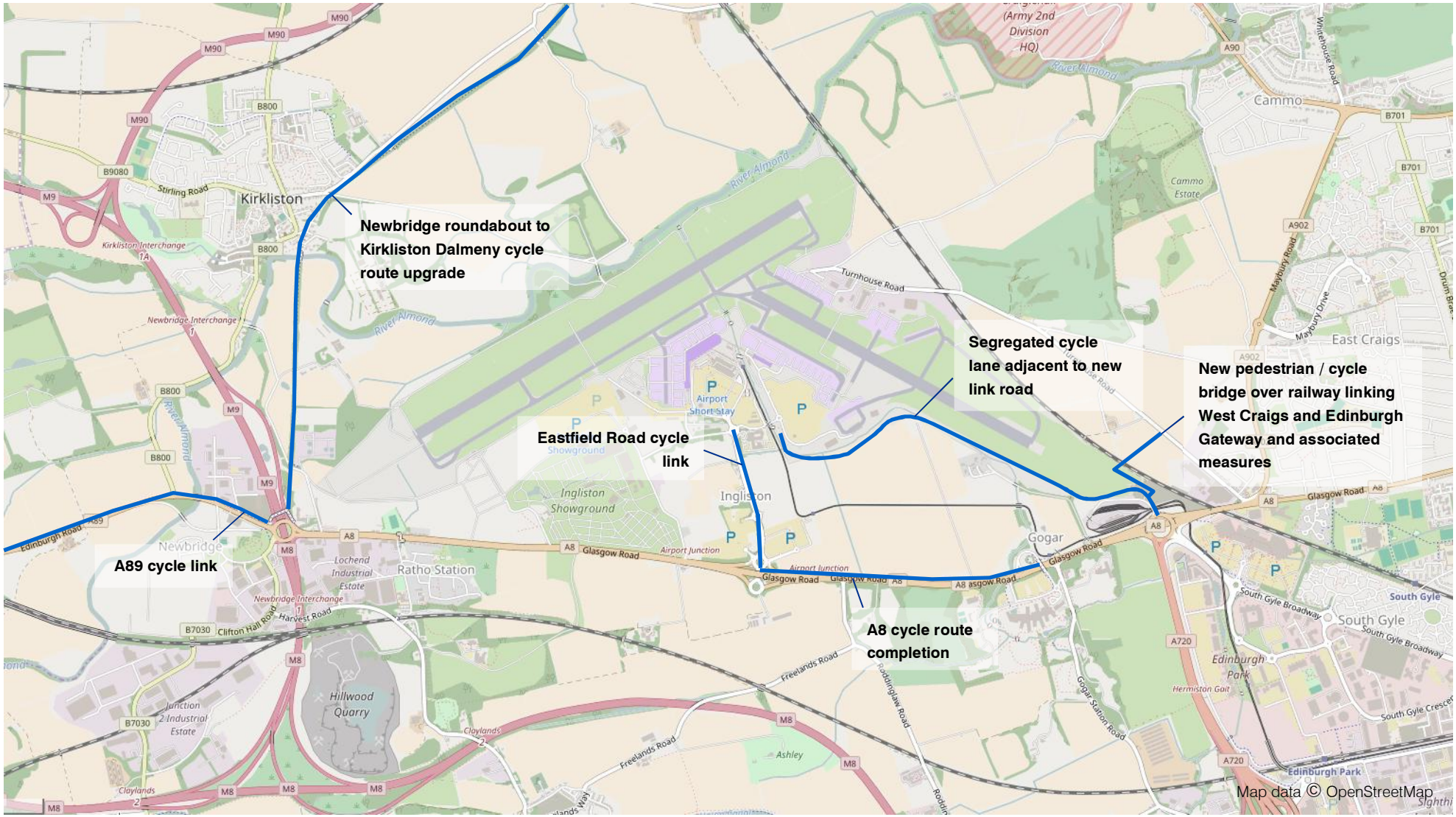

Figure 6.1: Proposed cycle measures

6.2.3 Coordination with Public Transport Improvements

- Proposed bus lane eastbound on A89 from Broxburn to Newbridge – ensure that cycle path on north side of A89 is preserved; desired path width is not impacted; and any bus-related facilities (signage or shelters) do not impede the pathway
- Proposed Newbridge Roundabout MOVA improvements – ensure that signalisation changes take into account movements from the north side A89 pathway to the south side toward Newbridge
- Proposed A8 bus lanes and widening – ensure that cycle paths on either side of A8 are preserved or replaced with improved provision and that desired path widths are not impacted adversely and any bus-related facilities (signage or shelters) do not impede pathways.
- Upgrade to Maybury Junction – ensure that any changes to signalisation or junction geometry take cycle path crossings into account.
- Gogar Roundabout MOVA installation – ensure that signalisation changes also benefit surface crossings for pedestrians and bicycles at the Gogar Roundabout.

6.3 Bus

Proposed bus related infrastructure has been developed through discussions with the Working Group for the study and through consultation with the major bus operators serving West Edinburgh (First Bus and Lothian Buses). Measures have also been informed by other studies namely the A89/ A8 Corridor – Public Transport Improvement Study undertaken by AECOM (for the City of Edinburgh Council (CEC) in association with Transport Scotland and West Lothian Council) and the Forth River Crossing Public Transport Strategy (FRCPTS) prepared for Transport Scotland by Jacobs. In addition, an analysis of key movements by public transport to and from the West Edinburgh area has been undertaken for this Refresh Study to help identify corridors which are currently underserved and scope the scale of services and supporting infrastructure required. The work has further been supported through accessibility modelling using TRACC, an accessibility modelling software package based around a database of all existing public transport services but with the potential to model additional linkages and services.

Both these more recent studies highlight the importance of bus priority measures in assisting buses to operate with more consistent as well as, in many cases, faster journey times helping deliver greater timetable reliability. Journey time reliability is an important issue for many existing and potential bus users and is one of the identified objectives of this Refresh study.

The introduction of Intelligent Transport Systems (ITS) based bus priority solutions are also seen as valuable measures that can further strengthen bus reliability. The adoption of ITS approaches at many of the key junctions as a key part of the roads based package within this study should allow further scope for these approaches to be taken forward in the West Edinburgh area although this will require a detailed investigation as part of any future ITS strategy for the City Region.

6.3.1 Forth Replacement Crossing Public Transport Strategy (FRCPTS)

The FRCPTS was published to support the FRC by delivering effective public transport facilities, and to ensure that levels of service provided for all transport modes after the opening of the FRC are at least equal to that which was provided in 2006, after the opening of the new crossing, now known as the Queensferry Crossing.

The FRCPTS provides full detail of the analysis undertaken of cross-Forth demand and the subsequent analysis techniques used to develop the strategy. The study was informed by actual and forecast origin and destination analysis, local authority land-use plans and information on a number of committed and proposed transport interventions throughout the area.

Demand for travel across the Forth currently exceeds capacity in the peak hours. Looking to the future, the adopted and emerging land use plans of the adjacent local authorities indicate a continued increase in the demand for travel across the Forth in both directions.

The analysis showed that the future origins and destinations remained broadly similar to those at present. However, considerable growth was forecast at some of these sites (including Edinburgh Airport and West Edinburgh), as well as the significant land releases at Winchburgh and West Lothian, mean the level of transport demand at these

locations is predicted to increase substantially along the A89/ A8 corridor. The analysis that accompanied the FRCPTS demonstrated that implementation of a range of measures was required to deliver the level of service outlined in the strategy.

A89 / A8 Corridor – Public Transport Improvement Study

This study was commissioned to take account of the content of the FRCPTS and focus on improving the flow of public transport in the vicinity of Newbridge Junction and along the A89/ A8 towards Edinburgh. The aim of the study was to identify the intervention measures required to aid public transport movement along the A89/ A8 corridor and thus improve bus journey times. It identified that the most pragmatic way of achieving this is through bus lanes and potentially by intelligent bus priority measures. The existing CEC Public Transport Strategy already identifies bus lanes on the A8 westbound and A89 eastbound and improvements to Newbridge Roundabout, for short to medium term delivery. These are:

- Eastbound bus lane on the A89 from Broxburn eastwards for approximately 2.1 kilometres;
- Eastbound bus lanes on the A8 from Eastfield Road eastwards for approximately 2.5 kilometres;
- Westbound bus lane on the A8 from Station Road westwards for approximately 500 metres; and
- Provision of traffic signals at Station Road, Ratho.

The A89/ A8 Corridor – Public Transport Improvement Study developed and tested preliminary designs for public transport infrastructure improvements for the A89/ A8 Newbridge Interchange Corridor and demonstrated how these design options are likely to improve public transport journey times. The designs focus on either developing additional public transport capacity through land acquisition or making use of the existing infrastructure through lane allocation and/or Intelligent Transport Systems-based solutions. The extents of any bus lanes were determined as part of the study and justified through model testing.

AECOM held a Stakeholder Working Group in February 2015 to discuss the progress of the project to date and receive valuable input from the major bus companies operating on the route. Representatives from Transport Scotland, The City of Edinburgh Council, West Lothian Council, SEStran, Stagecoach, Lothian Buses and First Group were present. An Open Stakeholder Workshop was held in March 2015 to present AECOM's proposals to a wider stakeholder group, including Police Scotland, community councils, additional bus operators, Edinburgh Airport, Fire Scotland and major employers such as RBS.

Survey work clearly demonstrated a tidal pattern, with low bus speeds eastbound into Edinburgh during the AM peak and then westbound to Newbridge during the PM peak. During the AM peak, vehicle speeds were low along the entire corridor, with speeds below 10mph from the airport to Gogar. The top speed in the AM peak was approximately 25mph. The reverse was evident in the PM peak, whilst speeds of around 37mph were achieved leaving the Marriot Hotel stop and out under the Gogar underpass, traffic congestion soon slowed buses to around 10mph from Gogarburn through to Broxburn.

Bus companies were in agreement with observed bus journey times and the proposed intervention measures being developed. The bus service providers were in agreement that the proposed improvements were acceptable and any improvement to bus journey times along the route would be beneficial.

The key emerging package of bus related measures from the AECOM Study were as follows:

- Bus lane under Gogar Roundabout to allow queue jump;
- A 3.65m wide bus lane on the A89 eastbound from Broxburn to Newbridge Roundabout;
- A 3.65m wide bus lane on the A8 westbound from Station Road to the Newbridge Interchange;
- A 3.65m wide bus lane on the A8 from the airport merge lane eastbound to the Maybury Junction; and
- A 3.25m wide bus lane on Maybury Road on the approach to the Maybury Junction.

Concept plans of the bus lanes recommended by the study are provided in the Appendices. Exact details of the extent of the bus lanes outlined will however need to be considered further when taking forward detailed design.

One measure that featured in the original WETA study that was not looked at in the AECOM study and has been discounted from this refresh study is hard shoulder running on the M8. There ae significant difficulties delivering such a scheme without impacting on overall vehicle journey time reliability, one of the key objectives set for both

WETA and the Refresh and it was not seen as a priority by the bus operators and Transport Scotland. There was agreement by the Working and Steering Groups that this would not be progressed as an option at this time.

The Working Group for this WETA Refresh Study fully supported the package of bus related measures emerging from the AECOM study (assuming that they are all deliverable) and these have been adopted as a key component of the recommended Refresh package. These measures have been taken into account in the subsequent modelling and accessibility analysis work and in the costings and phasing elements of the Study. Other measures such as the incorporation of MOVA traffic signal controls (Microprocessor Optimised Vehicle Actuation) and improved cycling facilities have been picked up as key elements of the wider package of proposed interventions for West Edinburgh.

The potential benefit of these measures modelled in the AECOM Report included improved eastbound bus journey times in the AM Peak against the Do-Minimum in 2015 of approximately 3 minutes along the A89 and 40 seconds along the A8. By 2027 the modelled impact was reduced bus journey times eastbound by approximately 15 minutes with the majority of the benefits being experienced along the A89.

In the PM Peak, the modelling demonstrated improved bus westbound journey times by around 6 minutes in 2015 with the majority of the improvements being experienced between the Airport and Newbridge Roundabout. There were also improved eastbound bus journey times around 2 minutes between the Airport and Maybury Junction. By 2027 there were increased bus journey times between Maybury and the Airport, due to increased queuing, however for buses but not general traffic these were more than compensated once they accessed the bus lane between the Airport and Newbridge.

One of the major benefits of the bus priority measures proposed for the A8/A89 corridor is the ability it provides for operators to respond with more attractive bus services from areas currently underserved. For this Refresh Study we have examined the level of accessibility provided by bus and indeed other PT modes in both the base position and with interventions applied. TRACC accessibility modelling software has been used for this which incorporates all of the existing bus network but also allows new services using improved infrastructure to be coded. The plot below highlights the benefits for the Livingston area of West Lothian with the introduction of a new service from South Livingston using the improved bus priority infrastructure proposed along the A89 and A8. It shows the journey time improvements experienced by residents in this area travelling to West Edinburgh. Analysis of census data using this modelling approach indicates that an additional 16,000 people would have access to a bus service to the West Edinburgh area if a semi-fast service was introduced utilising the new bus priority measures on the A89 and A8.

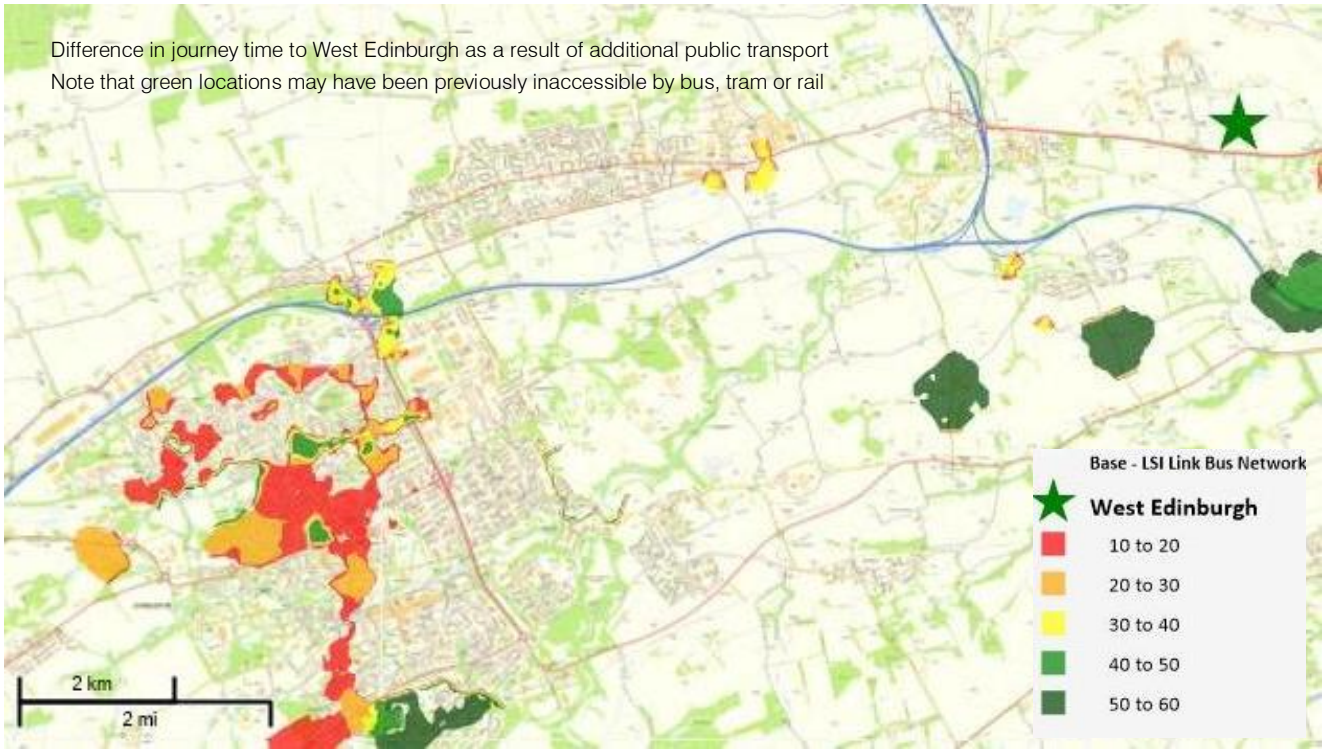

Figure 6.2: Travel time Impact of additional Bus Priority/Bus Link Measures

Whilst the A89/A8 study developed a range of measures that can provide significant benefits for bus services, particularly in terms of bus reliability at peak times, the brief for the study concentrated on the key West Lothian to and from Edinburgh corridor. Within this refresh study it was identified that it was very important to ensure that public transport measures and particularly bus related measures also considered other key movements from and to West Edinburgh.

The likely key movement patterns to and from West Edinburgh have been examined using the 2011 Census movements to the Edinburgh Park area as a proxy. Figure 6.3 from the WSP West Edinburgh Transport Study illustrates the key movements:

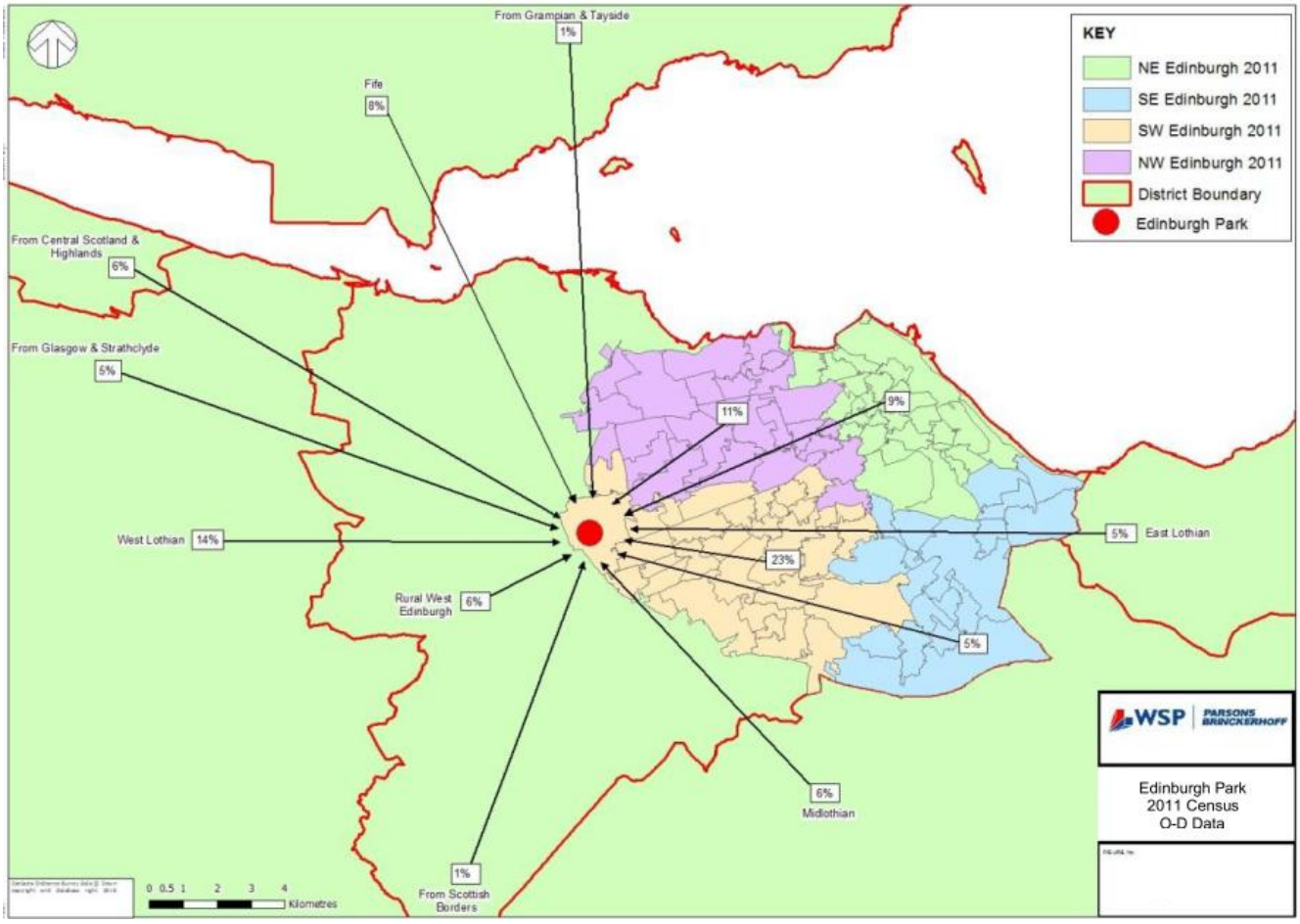

Figure 6.3: Edinburgh Park – census travel to work origin-destination data (courtesy of WSP | PB)

Whilst modal share from different sectors will clearly vary according to the supply of public transport provision (and indeed restraint measures such as car parking control) e.g. the high quality PT option to the City Centre provided by Tram, it does provide an indication of areas where significant improvements to bus service provision and bus priority measures to support these, should be prioritised.

The major movements into West Edinburgh from Edinburgh city centre and many other parts of Edinburgh are well catered for by bus in combination with Tram. This is clearly demonstrated in the TRACC accessibility plot (Figure 6.4), in this instance showing all PT including expected rail improvements in place by 2025 (e.g. Edinburgh Gateway and EGIP) and a new tram halt at IBG but with the existing bus services network.

This plot demonstrates the excellent base accessibility by PT services to and from the West Edinburgh area which re-enforces the capacity for development and airport growth to achieve high PT mode share. However, there are key movements from the Census analysis that are not well served. The accessibility from West Lothian will be significantly addressed by the A89/A8 bus priority interventions already detailed but whilst parts of the indicative 23% movement from South West Edinburgh are served by tram, outside the catchment for these services are areas not well served by PT i.e. through existing bus services. This has been a focus for work within the Refresh Study reinforced by the need to ensure attractive PT services can also be provided for any development occurring to the

south of the A8. Taking the combined proposed development and Airport growth figures for 2030 we would be looking at a total of 20 additional buses (assuming average of 40 passengers per bus) from and to SW Edinburgh. Whilst tram will cater for a proportion of these movements, a significant number of additional bus services will also be required.

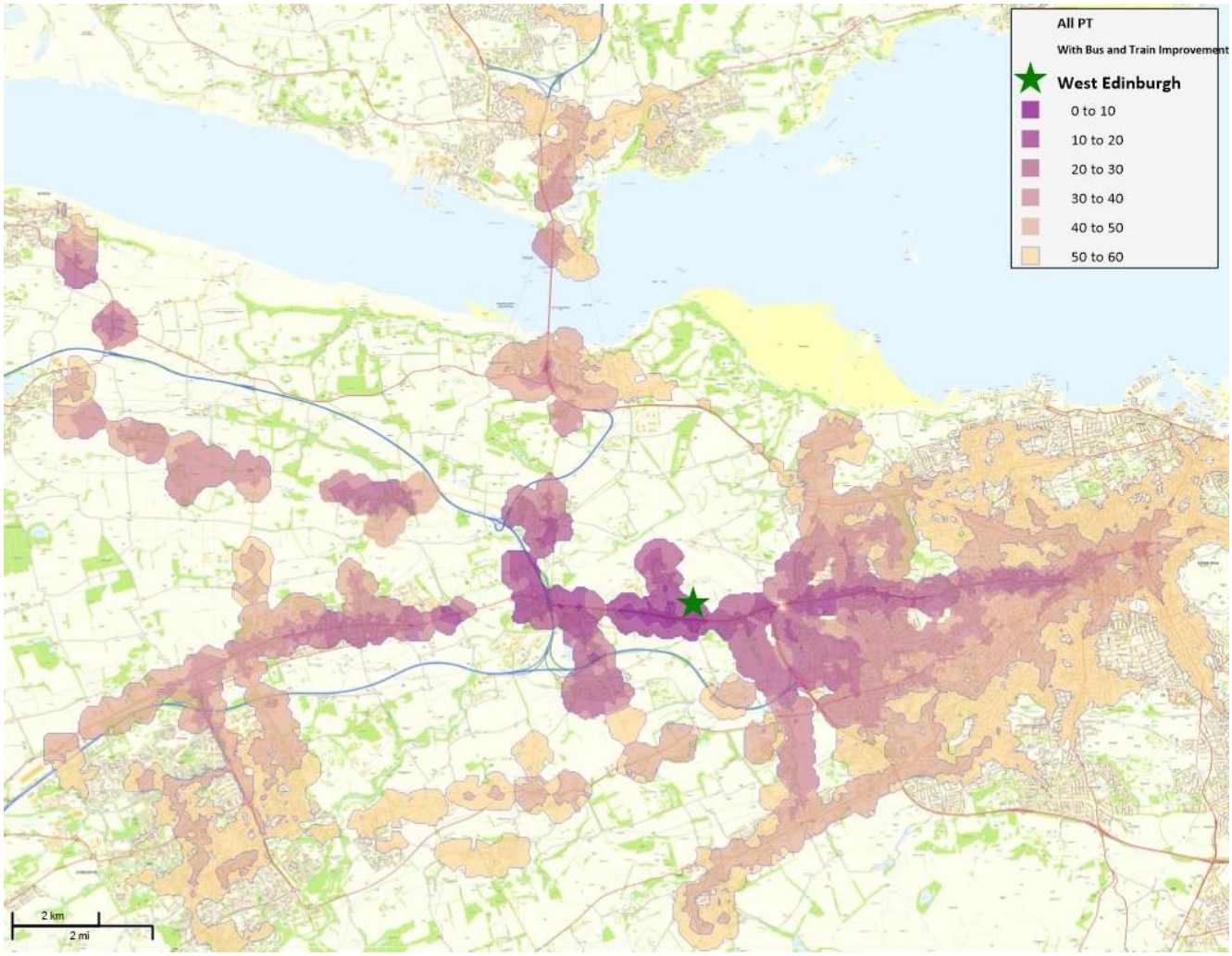

Figure 6.4: Travel time to West Edinburgh with bus and tram improvements

As a good example, the TRACC accessibility analysis indicates that although Balerno and Currie are less than 10 km south of the West Edinburgh study area, public transport provision between these residential areas and the West Edinburgh area is currently poor. Accessibility from and to the Heriot Watt Campus and indeed the Hermiston Park and Ride site is also limited. Whilst there is a bus service between the Hermiston Park and Ride site and the A8 corridor (Service 63 from Riccarton to South Queensferry), the journey time from Hermiston to the A8 corridor via the Sighthill Industrial Estate, Edinburgh Park and The Gyle shopping centre is typically around 22 minutes. These linkages are characterised by constraints in infrastructure which act as potential barriers to the establishment of fast bus connections from these areas to and from the proposed development sites to the north of the A8 and Edinburgh Airport. An improved connection between these locations could enable a number of routing options for new services including the potential for a direct bus service to be created to connect Balerno, Currie and Riccarton with Heriot Watt University and the Hermiston Park and Ride and the proposed West Edinburgh Developments and Airport. This would also increase access from the residential areas proposed for West Edinburgh to Heriot Watt University and surrounding employment.

To improve accessibility by bus from south west Edinburgh a key bus priority link across the A8 has been considered in concept to provide a bus only link from the RBS bridge and slip road over the A8 into the IBG development. There are, however, major constraints that have to be tackled if such a link was to be delivered. These include the need to bridge over the large ravine across the Gogar Burn, adjacent to the existing bridge, and

the designated Scheduled Monument to the north. Although the scheme has been appraised in Table 8.1, given the technical constraints, it is not recommended for further development.

An alternative at grade approach has also been considered with a dedicated bus-only access into the IBG East site off the A8 for northbound bus services entering the A8 from RBS, which would allow for a short dedicated right-turn lane across the eastbound carriageway. A left-out bus only junction on the northern side of the A8 would allow southbound buses to exit into a new section of eastbound bus lane before joining the RBS bridge at the existing off-slip. Potential journey time reliability on the A8 corridor remains a major concern with such a measure.

Assuming it is possible to deliver a bus only link across the A8 and into the IBG East site, connecting with the Gogar Link/Main Street described elsewhere in this report, it would allow a faster bus link from areas of South West Edinburgh and from Heriot Watt University (and indeed Hermiston Park and Ride site) through any developments to the south of the A8 and the RBS site to (and from) the West Edinburgh development sites and Edinburgh Airport. The TRACC Accessibility and Analysis plot below highlights the benefits for this part of the City Region from a new service from Balerno using the new bus link. Analysis of census data through this software indicates that some 17,000 additional people would be able to access a service with a total journey time (walking and on-bus) of less than an hour to West Edinburgh with this in place.

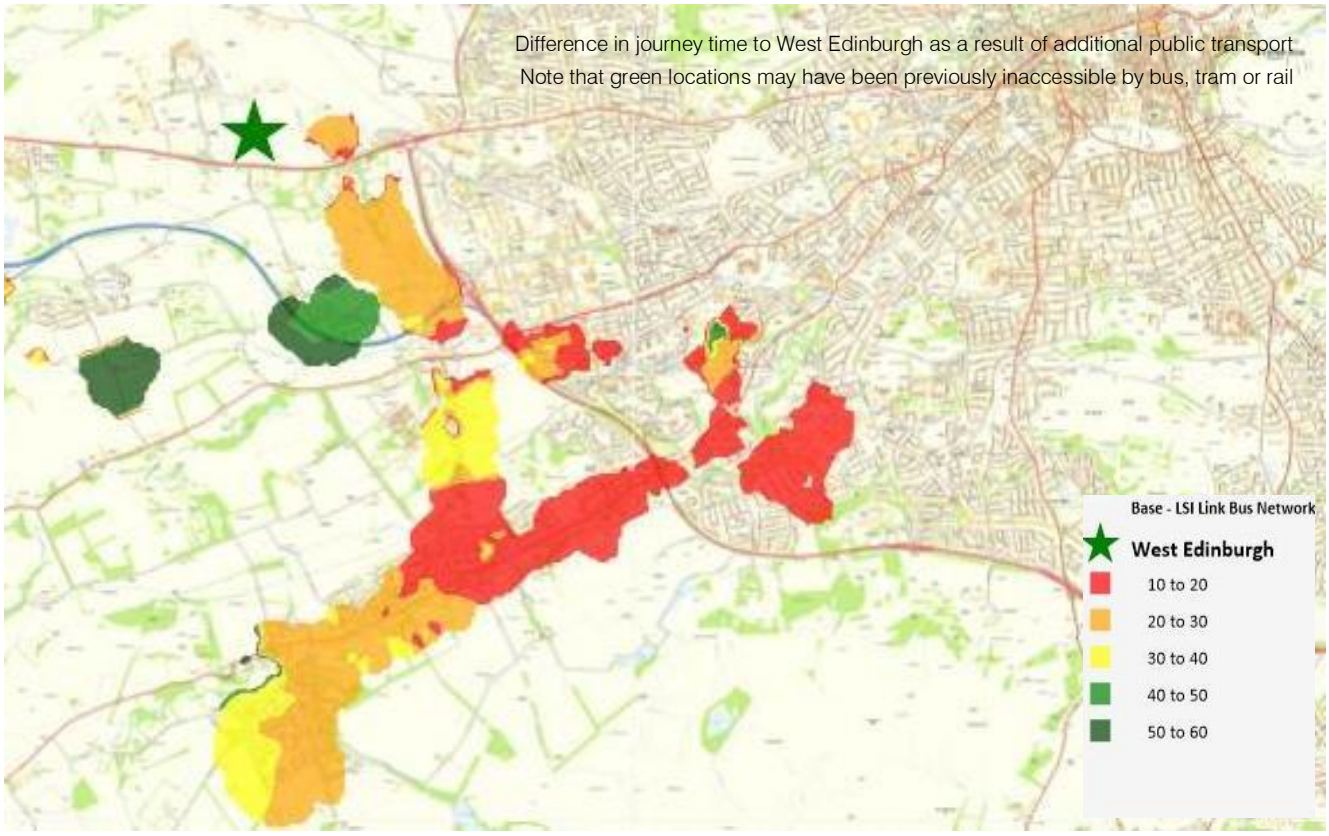

Figure 6.5: Interchange and Park and Ride Interventions

Should a bus only link across the A8 not prove deliverable, initial work has also been undertaken exploring potential bus priority improvements around the Gyle and South Gyle Broadway. In all development scenarios, The Gyle remains a key shopping, leisure and business destination. Improving public transport provision and journey times from north and south West Edinburgh has the potential to significantly increase mode share. Space is available to provide much improved bus priority and interchange, although the interface with the tram crossing, particularly at proposed higher tram frequencies, is a key consideration.

In addition to the bus priority and new bus links discussed above, the Refresh Study has focussed on measures that would improve accessibility through improved interchange. This includes interchange with other bus services, with tram, with cycle and with car. These interventions strongly address the objectives set for this Refresh Study.

The two key interventions that have emerged from this exercise in discussions with the bus operators, with West Lothian Council and with the Working and Steering Groups, have been a new Park and Ride site at Kilpunt, Broxburn on the A89 to the west of Newbridge and an improved bus / tram interchange at Ingliston.

The proposed Kilpunt Park and Ride site was one of the interventions suggested in an earlier WSP and JMP A89 Corridor Study for West Lothian Council. It is proposed that this would incorporate between 500 and 800 car parking spaces but also allow for bus to bus interchange and high quality cycle and ride facilities. The location of this new Park & Ride facility would help intercept commuting trips before reaching Newbridge. The bus priority measures along the A89 / A8 corridor, previously mentioned, would help complement this strategy, improving journey time reliability to and from West Edinburgh. It is recognised that this Park and Ride facility has wider benefits external to the West Edinburgh area and this needs to be reflected in funding arrangements.

At Ingliston, representatives from First Bus suggested that improved bus to bus as well as bus to tram interchange at this site could facilitate West Edinburgh being served by additional services from the West. This would allow some services to terminate here without continuing into central Edinburgh and help facilitate additional connections to Edinburgh Airport. Interchange between bus services and the tram stop would be significantly improved with better waiting facilities and improved tram stop shelter.

6.3.2 Summary of bus package

Newbridge bus priority

- Broxburn to Newbridge Roundabout eastbound bus lane
- Station Rd, Ratho Station to Newbridge Roundabout westbound bus lane

A8 to Maybury bus priority

- A8 eastbound bus lane – Eastfield Rd to Maybury
- Bus lane under Gogar roundabout
- Maybury Rd southbound bus lane
- Maybury Junction signal and capacity improvements

Improved north / South bus priority

- Improved bus priority linking South West Edinburgh with the Gyle, IBG and airport, including pedestrian / cycle facilities where appropriate

Interchange and Park & Ride

- Upgraded bus interchange at Ingliston
- Kilpunt Park & Ride

6.4 Tram

Edinburgh Gateway Station is due to open in December 2016 and is included as an additional stop in all tests. Interchange with rail services and walk and road connections to the local road network are all provided.

Future year tests include an additional stop at IBG and this is costed within the public transport package.

Initially modelling assumes an unchanged frequency of 8 trams per hour in the morning and evening peaks. As noted previously, Edinburgh Trams have added a number of peak within peak services to cater for increasing demand, particularly at Edinburgh Park. By a 2027 forecast year, IBG, RBS, Edinburgh Park and airport demand will be such that a 16 trams per hour frequency will be warranted. This increase, together with the Leith and Newhaven extension are included as part of a series of sensitivity tests to identify the impact of enhanced public transport provision in West Edinburgh.

The proposed Line 3 has not been included within the 2027 transport network at this stage. Implementation options are evolving and may be included within a wider City Deal application. A staged construction is being

considered, first between the city centre and the BioQuarter, and then to the Borders Railway with options for interchange at Newcraighall and Shawfair being evaluated.

While the proposed tram alignment between Ingliston and Newbridge remains protected, completion of the line to Newhaven followed by Line 3 to the BioQuarter and the Borders Railway are higher priorities. Consequently, and while the scheme has significant benefits, an extension of tram to Newbridge is not included as a long term intervention within the WETA refresh.

6.5 Rail

No rail specific measures are proposed within this Refresh Package.

As stated earlier in the report, there are though a number of rail related infrastructure and service improvements which are expected to further improve accessibility to the West Edinburgh area directly by train and also train interchanging with other modes such as tram and bus. This includes the new Edinburgh Gateway Station on the Fife line and the Edinburgh Glasgow Improvement Programme (EGIP) which includes modernisation and upgrades at key junctions and electrification of the main line between Edinburgh and Glasgow and to Stirling and Dunblane. These improvements have been taken into account within the modelling and accessibility analysis for this Refresh study. Other potential improvements described earlier, such as the Dalmeny/Almond Chord and associated services have not been included at this stage but could further improve accessibility and public transport journey times and reliability if delivered.

6.6 Road

A number of potential roads measures were considered for testing within the models including all the measures from the previous WETA 4c package (the basis for the current Action Programme) and variations of these emerging through discussion in the Working Group Sessions. From this the following key interventions have emerged:

6.6.1 Airport / IBG Link Road

In order to improve network resilience to Edinburgh Airport and to open up development opportunities in West Edinburgh, a network of new link roads/streets is proposed. In consulting on alternative options, it became clear that the needs of the IBG development and other developments in the area and those of the airport were somewhat different in configuration yet linked by a common set of infrastructure. The proposed Y shape of roads/streets emerged as the best option to address the different requirements whilst providing an efficient network with flexibility for public transport provision, walking, cycling and general road users.

The link road scheme can be divided into three sections as shown in Figure 6.7.

- Section 1 is a proposed 30mph dual carriageway, linking Gogar roundabout to a new junction where the airport and IBG sections of road diverge (shown in blue).
- Section 2 would be a high quality 30mph single carriageway link to the airport (shown in purple).
- Section 3 would be a 20mph / 30mph high quality main street within/ bordering the IBG development. It would be designed in accordance with Designing Streets and CEC Street Design Guidance with an emphasis on creating an urban character and a mix of uses.

Sections 1 and 2 should include a fully segregated cycleway. Careful attention to the street form of Section 3 at the detailed design phase, with a strong emphasis on place making qualities, will reduce speeds and minimise potential for rat-running. Specifically, when queues and delays occur on the A8, there is the potential for vehicles to divert via the IBG link roads/streets. By carefully implementing Designing Streets and CEC guidance, these impacts can be minimised. As an example, by keeping road widths appropriate to a city setting and by locating bus stops in general traffic lanes, an environment can be created which causes sufficient delay to discourage diversionary traffic while still effectively serving local needs.

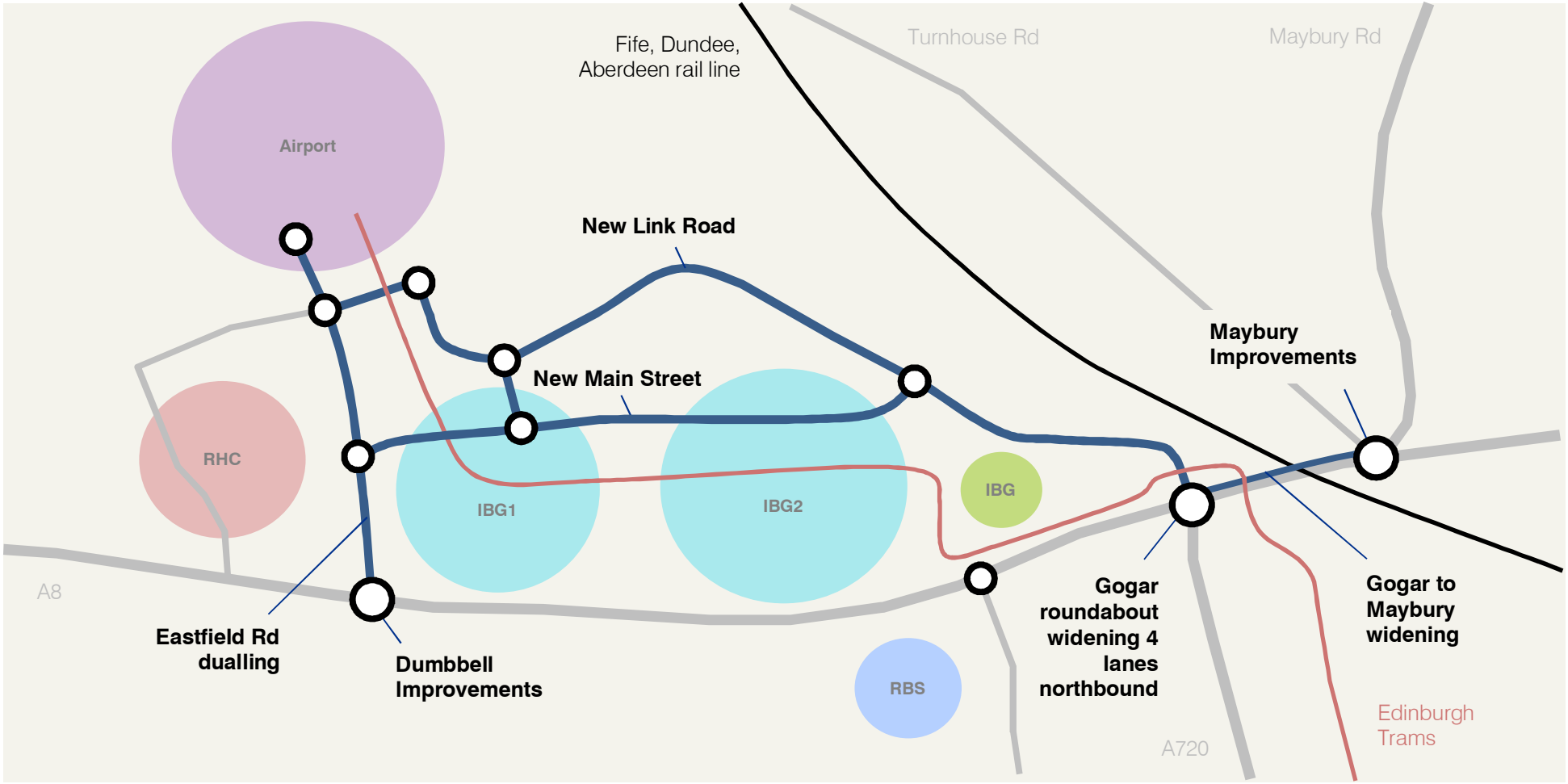

Figure 6.7: Indicative layout of new development Link Road / Main St, Eastfield Rd dualling and junction improvements

6.6.2 Eastfield Road

Traffic modelling indicates that the additional traffic generated by IBG, the Royal Highland Centre and Edinburgh Airport would exceed the capacity of the existing layout of Eastfield Road, even with the new link road. Junction capacity, at new and existing locations, and the need for network resilience necessitate a dual carriageway scheme.

VISSIM modelling has been previously undertaken by WSP to identify the package of measures required to support the IBG Phase 1 development and other development in the vicinity. This included the dualling and reconfiguration of the first section of Eastfield Road. The proposed design is summarised below and it is recommended that this is included within the revised WETA package of measures.

Eastfield Road / Main St access

To reduce congestion impacts caused by the development access and interaction with the dumbbell junction to the south, it is necessary to provide two lane approaches on Eastfield Road. The proposed traffic signal controlled junction is shown in Appendix B and includes pedestrian facilities across Eastfield Road and the IBG approach.

Two general traffic lanes would be provided southbound, from the airport, towards the IBG access. Northbound, two ahead lanes are proposed together with a dedicated right turn lane into the development. Two lanes are also provided on the IBG approach to Eastfield Rd.

Traffic signals would run under Microprocessor Optimised Vehicle Actuation (MOVA) control.

Ingliston Park & Ride access

It is proposed that the existing traffic signals at the Ingliston Park & Ride (P&R) bus access junction are also upgraded to MOVA. This will enable buses to benefit from priority access without causing significant disadvantage to general traffic. The junction can also be linked with the IBG access to provide northbound coordination for buses from the P&R.

As above, two general traffic lanes are provided southbound, from the airport; Northbound, two ahead lanes are proposed together with a dedicated right turn lane into the P&R site.

Full Dualling and signal coordination

Ultimately, to provide the required additional capacity through the IBG and P&R development access junctions and through to the airport, Eastfield Rd has been modelled as two continuous lanes in both directions from the dumbbells junction exit to the airport roundabout. Dumbbell, P&R and IBG development access traffic signals would be linked and operate under coordinated MOVA control.

WSP has recommended that conventional link cable can be installed alongside fibre optics to provide comprehensive communications between the junctions. Conventional linking enables MOVA strategies at each junction to be linked together providing coordination. A fibre optic link will enable operational strategies to be applied to all three junctions remotely by CEC Urban Traffic Control (UTC) from a single backhaul point. Such a feature is likely to prove particularly useful during showground events and would enable CEC to install IP CCTV cameras to aid UTC operators.

6.6.3 A8 / Eastfield Rd dumbbells

An option to increase capacity at the dumbbells junction is to increase capacity of the northbound carriageway through the underpass. Existing traffic lanes would be narrowed with two lanes provided northbound and one lane southbound. Footway widths should remain unaltered.

This proposal has been modelled and is recommended for implementation in conjunction with the Eastfield Rd dualling. Widening enables northbound traffic from the A8 westbound off-slip to queue using both lanes at a relatively low cost. In the medium term, it will also be necessary to signalise the westbound off slip at the southern dumbbell circulatory carriageway.

As noted previously, it is recommended that the traffic signal control strategy at the dumbbells junction is upgraded to MOVA, coordinated with the Eastfield Rd junctions to the north.

6.6.4 Newbridge

The previous WETA study recommended capacity improvements and public transport priority measures at and in the vicinity of Newbridge. WETA considered options to provide additional circulatory capacity (4 or 5 lanes) on the southern overbridge of the M9. In addition, two lanes would be provided from Newbridge northbound towards the M90.

Whilst a range of solutions were developed, major deliverability issues associated with construction were highlighted. In addition the identified layout would have required a departure from normal weaving standards which would require approval by Transport Scotland.

Further work undertaken by AECOM has identified detailed bus priority proposals and these are recommended for implementation, as outlined above. Consequently, It was agreed that within this study the emphasis would be to promote sustainable travel measures and explore more easily deliverable capacity options, including signal based ITS solutions. This was also within the context that capacity at Newbridge was one of the issues being addressed by the wider SESPlan Cross Boundary Study.

M9 to A8 left turn improvement

The proposed scheme to improve the left turn from the M9 to the A8 is shown in Appendix B. The design effectively modifies the left turn movement from a give-way entry onto the A8 to a dedicated left turn slip. Traffic entering the A8 from Newbridge roundabout is required to merge and be guided into the offside lane. Note that the cycle time of the roundabout traffic signal control is short and resulting platoons of traffic are small enough so as not to exceed the capacity of the merge.

With eastbound traffic from the M9 in the nearside lane and Newbridge traffic in the offside lane, both lanes combine, unimpeded, continuing as the A8 dual carriageway towards the city centre.

MOVA improvements at Newbridge

Further MOVA improvements are recommended to improve junction performance. Consideration should also be given to converting the B7030 approach to a give way entry, simplifying the operation of the rest of the junction. Gaps in traffic to allow B7030 traffic to enter (especially HGVs) can be maintained by controlling the M8 off-slip and circulatory traffic stages.

6.6.5 Gogar widening

Modelling and on-site observations highlight that delays at Gogar roundabout are primarily caused by the interaction with Maybury. As such, isolated improvement to Gogar offer limited benefit, relative the potentially high cost of construction.

Widening of the overbridge structures is not necessary or proposed. Nevertheless, it is possible to increase circulatory capacity on the western bridge by making use of an area currently hatched as not for use. Turning this road space into a fourth overbridge lane improves access to the Airport / IBG link road and, as a result, general roundabout performance.

6.6.6 Gogar Roundabout to Maybury

The existing Maybury junction is already over capacity and cannot accommodate additional West Edinburgh traffic without improvement. Maybury junction is not within the remit of this study although proposed improvements are being developed separately for implementation in the near future. The preferred scheme is described in more detail below.

The Gogar to Maybury section of the A8 is a major constraint on the local road network. Eastbound A8 traffic merges with eastbound traffic from the A720 and South Gyle. Traffic then diverges towards the A90 (Barnton) and A8 (city centre). Two underpass lanes and two roundabout lanes merge (total 4) merge into two lanes before diverging to three lanes at the Maybury junction. The resulting weaving movements cause traffic congestion during both morning and evening peak periods.

The constrained two lane section means that the road network through Gogar is not effectively used. In particular, traffic from the A8 should use the underpass if travelling towards Barnton, but many drivers choose to travel via the roundabout to avoid the potentially difficult merge manoeuvre.

Removing the existing constraint is potentially costly. The two lane section is on a railway overbridge and, while there appears to be room to widen the carriageway, an additional major difficulty is that there are complex utility services including major fibre optic cables in the verge and under the adjacent footway. Consultation with Network Rail and the utility providers will be vital to ascertain whether these issues can be overcome and to allow an accurate costing to be prepared.

WSP | PB has considered an option to implement ramp metering traffic signals on both the A8 eastbound on-slip from Gogar roundabout and the Gogar underpass. This would be implemented in conjunction with a modified layout between Gogar roundabout and Maybury (Appendix B). Jacobs has tested a simplified version of the scheme in VISSIM and, while it offers some improvement over the base, the benefits do not provide the step change in capacity required to enable the development of West Edinburgh. In particular, the operation of the airport / IBG link road remains compromised with queues resulting in the evening peak.

By comparison, the provision of a third lane eastbound lane markedly improves network performance throughout both peaks. Although some eastbound queueing occurs to the west of Gogar, the underpass and gyratory operate without significant issue, even in 2027. As a result, only localised queueing occurs on the new link road approach to the roundabout.

Further work will be required to assess the constraints and opportunities in delivering this scheme.

6.6.7 Maybury

Capacity improvements at Maybury are being developed by CEC[2], independently of the WETA refresh study. Figure 6.8 shows the general layout.

The primary change is that access to and from Turnhouse Rd is now direct from the A8. The phasing of the Turnhouse signals is designed so that A8 / Turnhouse traffic uses gaps in the otherwise stationary eastbound traffic.

A southbound bus gate is proposed on Turnhouse Road to prevent traffic from the new West Craigs development accessing Maybury junction directly. Instead egress from the development is via Craigs Road onto Maybury Road. Northbound traffic towards the development is unrestricted and able to travel by either route.

6.6.8 RBS Junction / Gogar Station Road

Improvements to the RBS junction may be required to support future traffic growth. These are not considered part of the wider WETA package of strategic infrastructure measures. Instead, capacity enhancements should be taken forward as part of the Transport Assessment for any future development in the vicinity of Gogar Station Road.

[2] Maybury Junction VISSIM Modelling, Final Report, August 2015

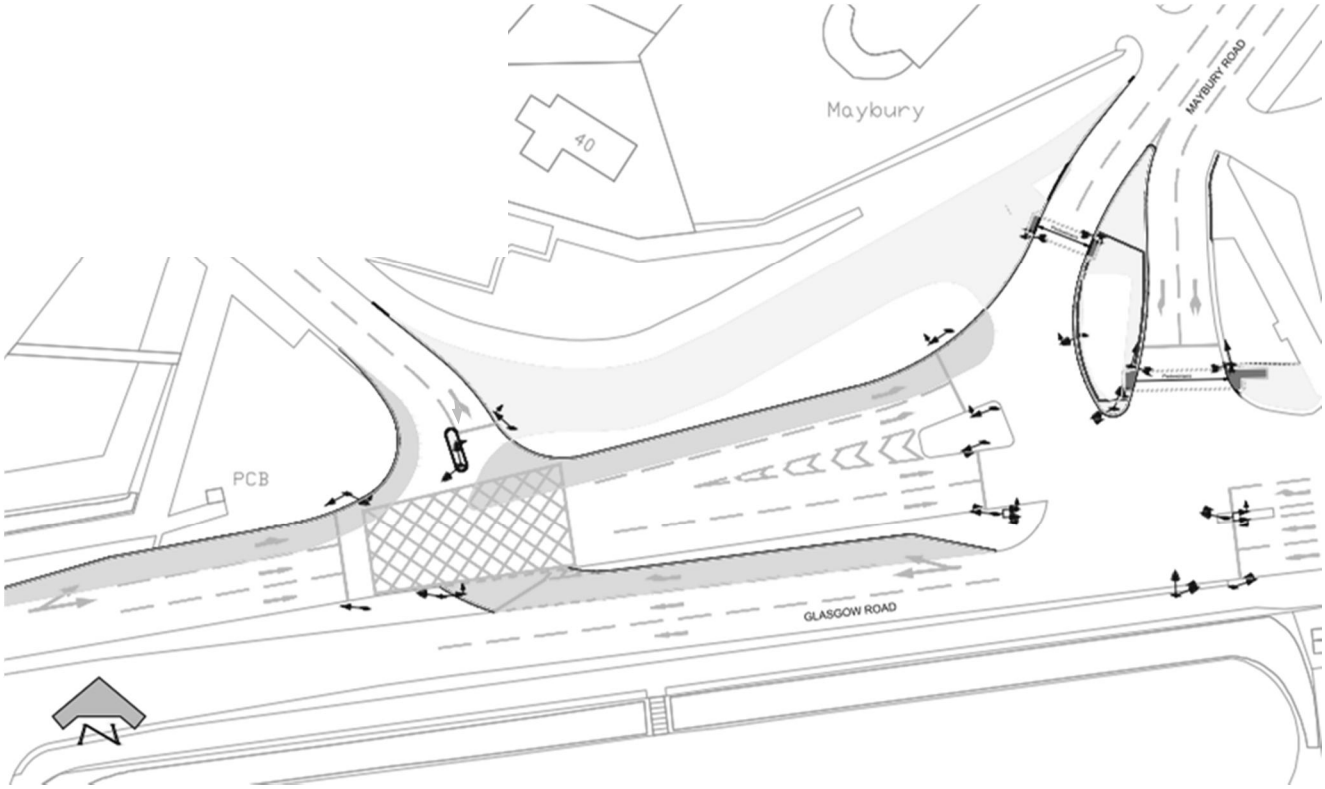

Figure 6.8: Preferred CEC Maybury design

The revised Maybury junction layout enables the eastbound carriageway from Gogar to be widened to three lanes, west of Turnhouse Road. Two lanes then bear left towards Maybury Rd; two ahead lanes serve eastbound traffic to Corstorphine and the city centre.

The general junction layout for westbound traffic is largely unchanged although an additional right turn lane is provided towards Turnhouse Road.

7. Modelling Approach

7.1 Introduction

In agreement with stakeholders, all strategic and microsimulation modelling has been undertaken using CEC's suite of VISUM and VISSIM models.

Although original developed in 2005-2007, in spring 2015 the strategic VISUM model was recalibrated to a 2014 base year. At the same time the model was ported to VISUM 14, providing improved robustness and increased functionality. The enhanced model provided a suitable platform to assess the Business Case for alternative tram extensions to McDonald Rd, Foot of the Walk, Ocean Terminal and Newhaven. The revised model was calibrated to include the completed tram route within the base network; it also included new count information collected in the vicinity of Leith Walk and at Newbridge and Maybury.

This was finalised in early May 2015 and is supported by an associated Model Calibration and Validation Report. An audit of model performance has been undertaken by Atkins as part of a review of the latest tram business case.

7.1.1 VISUM Model specification

The VISUM model is a 4-stage multi-modal model, including highway, bus, rail and tram public transport modes.

Although focused on Edinburgh, it also covers all major commuting catchments to the city and strategic movements from the rest of Scotland. Road and rail links across the whole of mainland Britain, necessary to allow traffic to travel to/from the study area, are also included. Demand matrices include all traffic to, from and through the study area.

The model is incremental using both observed and demand model matrices. To make best use of observed data, demand models are never used directly. Instead, the difference between the base demand matrix and the future demand matrix are added to the observed base matrix to create the forecast matrix used in the assignment.

- FUTURE YEAR DEMAND = BASE OBSERVED MATRIX + (DEMAND MODEL FUTURE – DEMAND MODEL BASE)

Base year matrices have been updated by matrix estimation using both new and historic count data. Future year trip ends have been revised, incorporating latest CEC development and TELMoS forecasts.

7.1.2 Model years and time periods

The observed model has been recalibrated to a base 2014 year. Forecast years are 2014 and 2027, the latter being consistent with TELMoS land use data.

The model has been developed for the following time periods:

- morning period, 07:00-09:00;
- interpeak, 10:00-12:00, and
- evening period, 16:00-18:00.

7.2 Additional Surveys

Generally, the VISUM model displays a level of calibration which is of a high standard throughout the city. Nevertheless, the previous focus has largely been on the city centre, tram corridor and proposed tram extensions.

While new count data at Newbridge and Maybury has been previously included, from consultation with stakeholders, it was agreed that a small focussed programme of additional data collection should be undertaken around Eastfield Rd to improve model representation and performance.

Count data was collected at:

- A8 / Eastfield Rd northern dumbbell
- Airport roundabout (Eastfield Rd / Fairview Rd)
- Fairview Rd / Almond Avenue

In addition, a link count was undertaken on South Gyle Broadway. New count data was also obtained from Transport Scotland for locations on the A720 and M8.

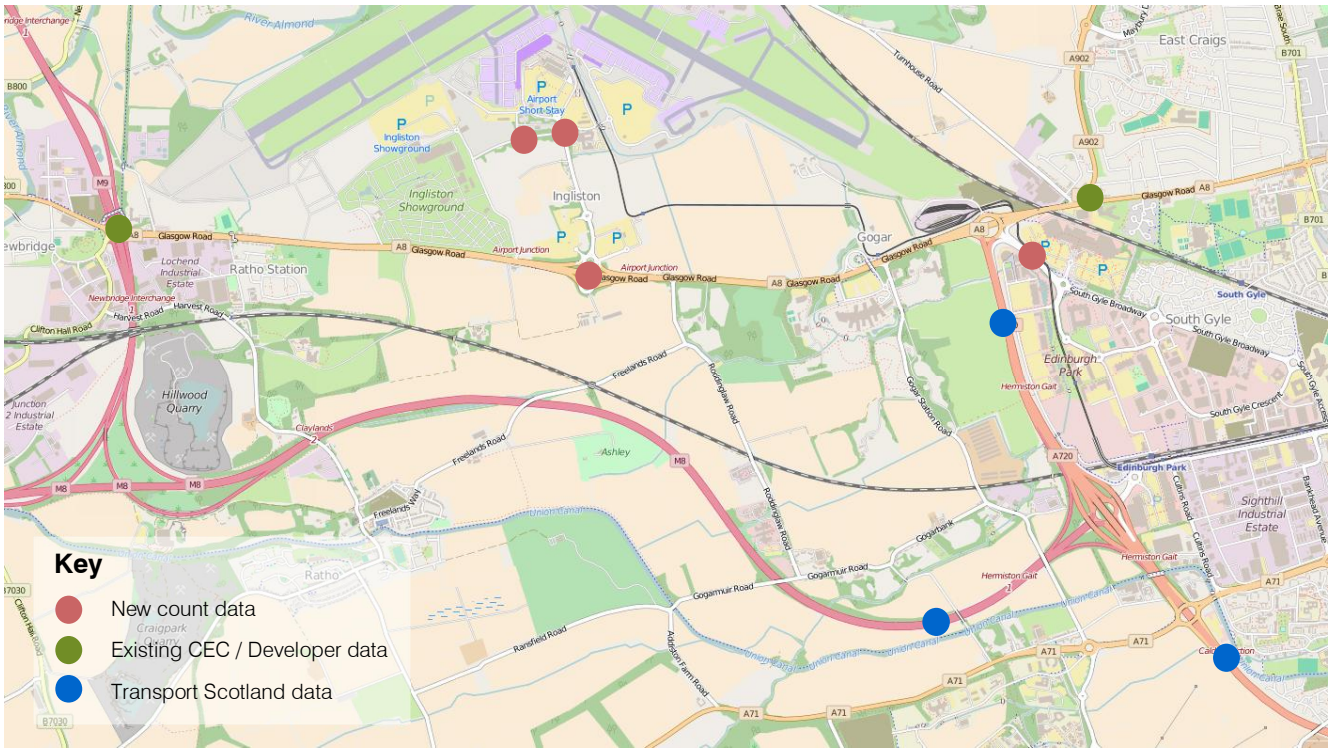

Figure 7.1: Additional localised count locations

Counts were undertaken between: 07:00-09:00, 10:00-12:00 and 16:00-18:00 on 5 May 2016. Classifications included: Car, LGV, HGV, Bus, Taxi, Motorcycle and Bicycle.

7.3 VISUM

7.3.1 Network enhancements

The original model zone system was based on TMfS, disaggregated in areas close to existing and proposed tram routes and aggregated outside the Edinburgh area.

In order to better represent proposed development within the study area, the zone system has been further disaggregated from 354 to 372 zones, as given in Table 7.1.

Table 7.1: Old and new zone correspondence

Old zone name	Old zone number	New zone name	New zone number
Burdiehouse Burn	186	Burdiehouse Burn	1861
Burdiehouse Burn	186	Potential housing site	1862
Riccarton	223	East of Heriot Watt University	2231
Riccarton	223	West of City Bypass	2232
Riccarton	223	Hermiston	2233
Edinburgh Park	226	East of Millburn Tower	2261
Edinburgh Park	226	Gogar Station Rd	2262
Gogar Mains	230	IBG East	2301
Gogar Mains	230	IBG West	2302
Gogar Mains	230	Land west of tram depot	2303
Turnhouse E	232	Cammo	2321
Turnhouse E	232	Turnhouse	2322
Turnhouse E	232	West Craigs East	2323
Turnhouse E	232	West Craigs West	2324
Ratho	235	Ratho village	2351
Ratho	235	Gogar Bank	2352
Ratho	235	Gogarmuir Rd	2353
Ratho	235	Roddinglaw Rd	2354
Ratho	235	Claylands	2355
Ratho	235	Craigpark	2356
Ratho	235	Addiston Farm	2357
Ratho	235	Long Dalmahoy Rd	2358
Ingliston W	240	Royal Highland Showground	2401
Ingliston W	240	RHS / Airport related development	2402
Airport	243	Airport main terminal	2431
Airport	243	Airport long stay	2432

An enhanced level of road network detail supports the revised zone system. Key additions include:

- Gogar Station Road (A71 – A8)
- Freelands Road (A8 – Baird Rd)
- Baird Rd / Harvest Rd (Ratho – Cliftonhall Rd)
- Cliftonhall Road (Harvest Rd / Newbridge)
- Burnshot Rd (A90 – Kirkliston)

Zone centroids have been revised to reflect existing and proposed development access locations. Figures 7.2 and 7.3 illustrate the original and enhanced base networks in the West Edinburgh area.

Figure 7.2: Original VISUM network

Figure 7.3: Enhanced VISUM network

7.3.2 Matrix development

Airport matrices

The airport demand and distribution profile is markedly different from other model zones. Historically, the Edinburgh VISUM model has used a series of external matrices, derived during the development of the Edinburgh Airport Rail Link project. These are now considered out of date and so, for consistency, new matrices have been generated from the Central Scotland Traffic Model (CSTM12). Airport zone private vehicle and public transport zone demand has been exported and aggregated / disaggregated to the Edinburgh model zone system.

Two airport zones have been created representing terminal / short stay and long stay travel. New traffic count data has been collected at the Airport / Eastfield Rd / Fairview Rd roundabout and morning and evening vehicle trip matrices have been calibrated to observed values. Public transport matrices have then been adjusted to be consistent with the observed 2015 airport mode share (33% of total demand).

Matrix estimation

Prior trip matrices were developed in 2005 / 06 during the original model development stage. Their construction is summarised in the original Edinburgh Tram JRC Model Calibration Report[3]. In updating the model, prior matrices have been adjusted by matrix estimation using both new and historic count data.

Observed matrices are assigned to the network and the process adjusts these in such a way that when assigned to the network, the link and turning flows and/or the trip ends better match observed values.

In many modelling packages, the matrix estimation methods employed rely on repeatedly factoring the matrix until a solution is arrived at. Factoring is undertaken in series and because many of the values in the matrix are affected by multiple control counts, the process has to be repeated iteratively until a suitable correlation is found for all the counts. Inevitably, this means that those trips that are affected by fewer control counts (usually the shorter trips) are subject to more extreme aggregate factors and this consequently distorts the trip distribution.

The matrix estimation process in VISUM is more complex; it attempts to find suitable factors by considering all control counts simultaneously. The most noticeable advantage of this is that the trip distribution is maintained, whilst still producing a good correlation between the count data and predicted flows.

The process uses the additional count data summarised in Section 6.2 above. Along the route of the proposed tram extension, additional 2014 count data is included at locations including: Picardy Place, Leith Walk / London Rd, Annandale St, McDonald Rd and Pilrig St. Elsewhere count updates have been included at George IV Bridge, South Bridge, Nicolson St and Angle Park Terrace.

Tram boardings and alightings by stop were previously provided by Edinburgh Trams. These have processed to give cumulative link loadings along the route of the tram. These resulting counts have been used to calibrate base year tram patronage.

Airport matrices

In reviewing the inputs to previous work, it was identified that travel information relating to Edinburgh Airport was now unacceptably dated. For this model update, highway and public transport demand to the airport is now based on CSTM12 matrices. CSTM matrices have processed to the Edinburgh Model zone system and calibrated to Eastfield Road count data. Zones 2431 and 2432 represent the terminal and long stay areas respectively.

Airport public transport matrices have been adjusted to reflect the observed base year mode share (33%).

Note that airport matrices are assumed to be fixed – they are not adjusted during the matrix estimation and model calibration process. Future year matrices are factored from the base based on forecast Million Passengers per Annum (Mppa) numbers in 2030.

[3] Edinburgh Tram – Leith Extensions, VISIM Model Calibration and validation report, Jacobs, May 2015

7.3.3 Model calibration

The base model has been calibrated in accordance with WebTAG standards:

- *Web-based Transport Appraisal Guidance (WebTAG) unit M3.1 Highway Assignment Modelling Criteria (January 2014)*[4]

The appraisal guidance sets out measures to compare the base year model against observed independent data to quantify the level of fit. Primary model calibration/validation measures will be:

- assigned flows and count comparison on individual links and turning movements at junctions, as a check on the quality of the assignment; and
- modelled and observed journey time comparison along routes, as a check on the quality of the network and the assignment.

Guidance criteria are strictly for model validation, however, they are typically used to assess the quality of both the model calibration and validation. Two measures are used:

- The GEH statistic, which is useful in comparing two different values of flow on a link. The GEH statistic is defined as:

  GEH = √ [(Modelled-Observed) / { (Observed + Modelled) / 2 }].

- The absolute and percentage differences between modelled flows and counts.

Both measures are broadly consistent, and link and turning flows that meet either criterion should be regarded as satisfactory.

A summary of calibration criteria is given in Table 7.2 below.

Table 7.2: Link flow and turning movement calibration criteria

Description of criteria	Acceptability guideline
Individual flows within 100 veh/hr of counts for flows less than 700 veh/hr	>85% of cases
Individual flows within 15% of counts for flows from 700 veh/hr to 2,700 veh/hr	>85% of cases
Individual flows within 400 veh/hr of counts for flows more than 2,700 veh/hr	>85% of cases
GEH <5 for individual flows	>85% of cases

Highway model vehicle flows have been calibrated across a series of screenlines, including: City Centre, Leith, Northern, Bridges, Western, and Bypass locations. Similarly, public transport passenger flows have been calibrated against a series of counts provided by Lothian Buses and Edinburgh Trams.

Within the study area, base models have been calibrated to turning count data with the results summarised in Tables 7.3 and 7.4 below.

[4] www.gov.uk/government/publications/webtag-tag-unit-m3-1-highway-assignment-modelling

Table 7.3: AM road calibration

		obs car	mod car	m/o car	GEH car	diff car	GEH car	obs total	mod total	m/o total	GEH total	diff total	GEH total
Eastfield Rd													
Jubilee Rd	NB	573	610	7%	1.5	✓	✓	573	618	8%	1.9	✓	✓
Jubilee Rd	SB	522	522	0%	0.0	✓	✓	522	531	2%	0.4	✓	✓
Burnside Rd	EB	310	299	-4%	0.6	✓	✓	363	300	-17%	3.5	✓	✓
Burnside Rd	WB	204	203	-1%	0.1	✓	✓	241	204	-15%	2.4	✓	✓
Eastfield Rd	NB	869	938	8%	2.3	✓	✓	939	981	4%	1.4	✓	✓
Eastfield Rd	SB	741	807	9%	2.4	✓	✓	807	867	7%	2.1	✓	✓
Fairview Rd	EB	343	212	-38%	7.9	×	×	390	261	-33%	7.1	×	×
Fairview Rd	WB	215	158	-26%	4.1	✓	✓	250	193	-23%	3.9	✓	✓
South Gyle Broadway													
South Gyle Broadway	EB	354	390	10%	1.9	✓	✓	408	472	16%	3.1	✓	✓
South Gyle Broadway	WB	1701	1742	2%	1.0	✓	✓	1812	1888	4%	1.8	✓	✓
Eastfield Rd N dumbbell													
Eastfield Rd N of P&R	SB	732	810	11%	2.8	✓	✓	802	877	9%	2.6	✓	✓
Eastfield Rd N of P&R	NB	894	943	5%	1.6	✓	✓	964	995	3%	1.0	✓	✓
Car Park East (P&R)	WB	28	0	-100%	7.5	✓	×	30	0	-100%	7.7	✓	×
Car Park East (P&R)	EB	333	306	-8%	1.5	✓	✓	339	307	-9%	1.8	✓	✓
Eastfield Rd dumbbell	NB	906	852	-6%	1.8	✓	✓	951	901	-5%	1.6	✓	✓
Eastfield Rd dumbbell	SB	289	339	17%	2.8	✓	✓	338	387	15%	2.6	✓	✓
Glasgow Rd EB off-rmp	NB	580	564	-3%	0.7	✓	✓	624	579	-7%	1.9	✓	✓
Glasgow Rd EB on-rmp	SB	566	640	13%	3.0	✓	✓	601	668	11%	2.7	✓	✓
Maybury													
Glasgow Rd E	EB	940	782	-17%	5.4	×	×	1220	1002	-18%	6.5	×	×
Glasgow Rd E	WB	1387	1182	-15%	5.7	✓	×	1666	1408	-15%	6.6	×	×
Maybury Rd	NB	999	912	-9%	2.8	✓	✓	1264	1175	-7%	2.6	✓	✓
Maybury Rd	SB	1072	1060	-1%	0.4	✓	✓	1310	1286	-2%	0.7	✓	✓
Glasgow Rd E	EB	1891	1860	-2%	0.7	✓	✓	2414	2315	-4%	2.0	✓	✓
Glasgow Rd E	WB	2334	2167	-7%	3.5	✓	✓	2804	2571	-8%	4.5	✓	✓
Turnhouse Rd	NB	127	139	9%	1.0	✓	✓	167	180	8%	1.0	✓	✓
Turnhouse Rd	SB	126	137	9%	1.0	✓	✓	174	189	8%	1.1	✓	✓
Newbridge													
A8	EB	2502	2328	-7%	3.5	✓	✓	3127	2833	-9%	5.4	✓	×
A8	WB	1200	1186	-1%	0.4	✓	✓	1500	1449	-3%	1.3	✓	✓
M8 off slip	NB	1096	1123	3%	0.8	✓	✓	1370	1259	-8%	3.1	✓	✓
M8 on slip	SB	599	568	-5%	1.3	✓	✓	749	638	-15%	4.2	✓	✓
Newbridge	NB	384	369	-4%	0.8	✓	✓	487	460	-5%	1.2	✓	✓
Newbridge	SB	795	743	-6%	1.9	✓	✓	908	865	-5%	1.5	✓	✓
A89	EB	940	884	-6%	1.9	✓	✓	1176	1084	-8%	2.7	✓	✓
A89	WB	512	459	-10%	2.4	✓	✓	641	592	-8%	2.0	✓	✓
M9 on slip	NB	700	676	-3%	0.9	✓	✓	875	845	-3%	1.0	✓	✓
M9 off slip	SB	1436	1351	-6%	2.3	✓	✓	1795	1664	-7%	3.1	✓	✓
M8													
M8 0.25 Mile EB A720	EB	2199	2354	7%	3.3	✓	✓	2567	2718	6%	2.9	✓	✓
M8 0.25 Mile WB A720	WB	1199	1340	12%	4.0	✓	✓	1400	1551	11%	3.9	✓	✓
A720													
A720 1 mile N Calder J	WB	1650	1418	-14%	5.9	✓	×	1837	1591	-13%	5.9	✓	×
A720 1 mile N Calder J	EB	972	808	-17%	5.5	×	×	1177	988	-16%	5.7	×	×
A720 1/4 m S Calder J	EB	2092	1869	-11%	5.0	✓	✓	2442	2155	-12%	6.0	✓	×
A720 1/4 m S Calder J	WB	2524	2421	-4%	2.1	✓	✓	2947	2776	-6%	3.2	✓	✓

Table 7.4: PM road calibration

		obs	mod	m/o	GEH	diff	GEH	obs	mod	m/o	GEH	diff	GEH
		car	car	car	car	car	car	total	total	total	total	total	total
Eastfield Rd													
Jubilee Rd	NB	556	590	6%	1.4	✓	✓	568	601	6%	1.4	✓	✓
Jubilee Rd	SB	605	726	20%	4.7	×	✓	618	743	20%	4.8	×	✓
Burnside Rd	EB	301	292	-3%	0.5	✓	✓	329	313	-5%	0.9	✓	✓
Burnside Rd	WB	321	319	0%	0.1	✓	✓	348	342	-2%	0.4	✓	✓
Eastfield Rd	NB	811	864	7%	1.8	✓	✓	867	921	6%	1.8	✓	✓
Eastfield Rd	SB	893	902	1%	0.3	✓	✓	953	967	1%	0.4	✓	✓
Fairview Rd	EB	223	46	-79%	15.3	×	×	259	74	-71%	14.3	×	×
Fairview Rd	WB	193	171	-12%	1.7	✓	✓	227	198	-13%	2.0	✓	✓
South Gyle Broadway													
South Gyle Broadway	EB	1607	1719	7%	2.8	✓	✓	1743	1817	4%	1.7	✓	✓
South Gyle Broadway	WB	432	558	29%	5.7	×	×	511	660	29%	6.1	×	×
Eastfield Rd N dumbbell													
Eastfield Rd N of P&R	SB	982	898	-9%	2.8	✓	✓	1043	966	-7%	2.4	✓	✓
Eastfield Rd N of P&R	NB	817	864	6%	1.6	✓	✓	872	924	6%	1.7	✓	✓
Car Park East (P&R)	WB	244	290	19%	2.8	✓	✓	244	290	19%	2.8	✓	✓
Car Park East (P&R)	EB	5	0	-100%	3.2	✓	✓	5	0	-100%	3.2	✓	✓
Eastfield Rd dumbbell	NB	814	635	-22%	6.6	×	×	857	675	-21%	6.6	×	×
Eastfield Rd dumbbell	SB	702	655	-7%	1.8	✓	✓	754	708	-6%	1.7	✓	✓
Glasgow Rd EB off-rmp	NB	376	341	-9%	1.8	✓	✓	402	366	-9%	1.8	✓	✓
Glasgow Rd EB on-rmp	SB	593	645	9%	2.1	✓	✓	620	665	7%	1.8	✓	✓
Maybury													
Glasgow Rd E	EB	888	833	-6%	1.9	✓	✓	1047	959	-8%	2.8	✓	✓
Glasgow Rd E	WB	1118	937	-16%	5.7	×	×	1325	1094	-17%	6.6	×	×
Maybury Rd	NB	911	1023	12%	3.6	✓	✓	1064	1209	14%	4.3	✓	✓
Maybury Rd	SB	885	863	-3%	0.8	✓	✓	1054	1031	-2%	0.7	✓	✓
Glasgow Rd E	EB	1722	1876	9%	3.6	✓	✓	2012	2160	7%	3.2	✓	✓
Glasgow Rd E	WB	1766	1719	-3%	1.1	✓	✓	2092	2010	-4%	1.8	✓	✓
Turnhouse Rd	NB	118	127	8%	0.8	✓	✓	156	169	8%	1.0	✓	✓
Turnhouse Rd	SB	147	146	-1%	0.1	✓	✓	178	177	0%	0.0	✓	✓
Newbridge													
A8	EB	1286	1279	-1%	0.2	✓	✓	1461	1436	-2%	0.7	✓	✓
A8	WB	1932	1976	2%	1.0	✓	✓	2195	2223	1%	0.6	✓	✓
M8 off slip	NB	693	617	-11%	3.0	✓	✓	787	697	-11%	3.3	✓	✓
M8 on slip	SB	832	810	-3%	0.8	✓	✓	946	879	-7%	2.2	✓	✓
Newbridge	NB	387	258	-33%	7.2	×	×	496	335	-32%	7.9	×	×
Newbridge	SB	336	312	-7%	1.4	✓	✓	419	386	-8%	1.6	✓	✓
A89	EB	598	528	-12%	3.0	✓	✓	680	611	-10%	2.7	✓	✓
A89	WB	665	623	-6%	1.6	✓	✓	755	737	-2%	0.7	✓	✓
M9 on slip	NB	1198	1173	-2%	0.7	✓	✓	1361	1340	-2%	0.6	✓	✓
M9 off slip	SB	738	733	-1%	0.2	✓	✓	838	827	-1%	0.4	✓	✓
M8													
M8 0.25 Mile EB A720	EB	1736	1691	-3%	1.1	✓	✓	1851	1810	-2%	1.0	✓	✓
M8 0.25 Mile WB A720	WB	2074	2105	1%	0.7	✓	✓	2212	2195	-1%	0.3	✓	✓
A720													
A720 1 mile N Calder J	WB	863	826	-4%	1.3	✓	✓	1007	964	-4%	1.4	✓	✓
A720 1 mile N Calder J	EB	1841	1690	-8%	3.6	✓	✓	2000	1827	-9%	4.0	✓	✓
A720 1/4 m S Calder J	EB	2744	2690	-2%	1.0	✓	✓	2925	2845	-3%	1.5	✓	✓
A720 1/4 m S Calder J	WB	2564	2441	-5%	2.5	✓	✓	2734	2606	-5%	2.5	✓	✓

7.3.4 Forecast years and development scenarios

A nominal forecast year of 2030 has been assumed for each West Edinburgh development, including the airport. Outside Edinburgh, background growth is based on TELMoS data - note that 2027 growth has been applied as this data was readily available and previously processed to the Edinburgh Model zone system.

An additional sensitivity test has been undertaken to test the operation of the A8 / Eastfield Rd dumbbells with forecast 2040 airport demand.

Two alternative test scenarios have undertaken.

Scenario A – demand model trip generation and mode share

As noted previously, the Edinburgh Model has full demand model capability. Typically, new development is included within the model based on its land use type. Within each zone, new housing is included as the number of additional units, office and commercial development is included as the gross floor area of the development, converted to the number of employees. Education developments are included within the model as the number of additional students. Resulting development trips, their distribution and model choice are calculated automatically by the demand model and assigned to the model network to identify the forecast transport impacts.

Scenario B – Transport Assessment trip generation and mode share

With this scenario, private vehicle trip generation has been assumed to be as given in each Transport Assessment. These have either been provided by the development promoters or through interrogation of the CEC planning application portal.

These are assigned accordingly although the distribution of trips is still determined by the model, consistent with Scenario A above.

It should be noted that various methodologies have been used to derive trip rates for each development. These reflect individual development characteristics and accessibility and, for a number of developments, are the result of agreements reached on scoping with City of Edinburgh Council and Transport Scotland. As a result, with Scenario B, two similar development types may generate quite different trip numbers. Consequently, Scenario B represents an 'as given' development scenario where as Scenario A seeks to test a more consistent trip generation methodology across all development types.

7.3.5 Package of public transport measures

Four model scenarios have been tested with different public transport interventions. These are:

1 8 trams per hour between Airport and York Place

2 8 trams per hour between Airport and Newhaven

3 8 trams per hour between the Airport and Newhaven and parking controls at IBG 1 and 2

4 16 trams per hour between the Airport and Newhaven and an improved package of bus measures

- Airport to Balerno and Heriot Watt
- Improved bus links between the airport and Livingston

In testing the above, it is important to note that the model does not include a public transport crowding model. As such, bus and public transport routes are assumed to have sufficient capacity to cater for all assigned demand and increased tram and bus frequencies only impact upon boarding stop wait time.

7.3.6 Trip generation and mode share

Scenario A

Scenario A major development modelled mode shares for the Airport to Newhaven test are given in summarised in Table 7.5. Summaries for other options are given in Appendix C.

Forecast airport mode shares have been modelled to be consistent with information provided by Edinburgh Airport across Zones 2431 and 2432, a public transport mode share of 37% is assumed, an increase from approximately 33% in 2015.

The forecast morning peak public transport forecast mode share to IBG 1 and 2 is around 46% and 43% respectively – broadly consistent with the overarching 2010 WETA assumption. Origin values are slightly lower at approximately 31 / 32%. While a high level of public transport mode share to the city centre is noted, other destinations are less well served by bus and tram.

Evening peak public transport mode shares to and from IBG are forecast to be lower, in part due the wider range of trip purposes observed in the evening period. Outbound mode share is between 32 and 38%, inbound mode shares are approximately 15%.

The modelled public transport trip generation from East of Millburn Tower is around 21% in the morning peak and 9% in the evening. These values reflect the effect of the walking distance to the A8 and Edinburgh Gateway interchange. A local bus route, serving the site may help increase public transport mode share.

Public transport usage to and from Fairview Mill is slightly higher than expected although the absolute number of trips is low.

Scenario B

A comparison of Scenario A and B trip generation is given in Table 7.6. Airport, Park & Ride and RBS trip values are largely unchanged.

The most significant difference between both Scenarios is the level of traffic generated by housing, outbound in the morning peak and inbound in the evening peak – with Scenario A generating higher values.

It is important to note that Scenario B is derived by adjusting private vehicle trip totals to the Transport Assessment numbers provided by each consultant. The highway assignment is then run to generate new link and turn flows. A revised public transport mode share is not run for this scenario as the model has not been developed to be run in this manner. Nevertheless, as there is no public transport crowding model, it is a reasonable methodology for the level of analysis required.

Table 7.5: Scenario A, 8 trams per hour, Airport - Newhaven trip generation and mode share

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	2288	2880	234	1102	1271	1089	0	804	508	380	128	56	147	1714	1099	50
HGV	7	7	3	4	3	4	0	0	62	61	0	0	2	14	10	13
LGV	12	11	2	3	2	4	0	0	29	43	0	0	15	121	9	5
PuT	1560	1972	124	999	628	875	895	0	6	88	35	66	14	501	330	0
PrT [Pers]	2654	3333	275	1276	1467	1262	0	924	689	557	147	64	188	2125	1286	78
PuT [Pass]	1560	1972	124	999	628	875	895	0	6	88	35	66	14	501	330	0
Prt+PuT{Pers]	4214	5306	399	2275	2095	2136	895	925	696	645	182	131	202	2627	1616	78
PT mode share %	37%	37%	31%	44%	30%	41%	100%	0%	1%	14%	19%	51%	7%	19%	20%	0%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	3534	2994	727	216	745	1292	804	0	188	440	66	87	1655	78	49	1055
HGV	22	23	2	2	2	2	0	0	34	20	0	0	16	1	10	12
LGV	54	41	2	2	2	2	0	0	22	37	0	0	133	12	5	4
PuT	2420	2051	502	45	396	210	0	895	68	84	62	4	269	20	1	129
PrT [Pers]	4152	3516	840	252	861	1490	925	0	280	572	75	100	2075	105	73	1232
PuT [Pass]	2420	2051	502	45	396	210	0	895	68	84	62	4	269	20	0	129
Prt+PuT{Pers]	6572	5567	1343	297	1258	1700	925	895	347	655	137	104	2344	126	73	1361
PT mode share %	37%	37%	37%	15%	32%	12%	0%	100%	19%	13%	45%	4%	11%	16%	0%	10%

Table 7.6: Scenario A and B, 8 trams per hour, Airport - Newhaven private vehicle trips comparison

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	2308	2899	239	1109	1276	1097	0	804	599	484	128	56	163	1848	1119	68
Scenario B	2308	2899	319	835	578	778	0	804	151	319	266	259	163	1805	862	229
B – A	0	0	80	-274	-698	-319	0	0	-448	-165	138	203	0	-43	-257	161
% difference	0.0%	0.0%	33.5%	-24.7%	-54.7%	-29.1%	0.0%	0.0%	-74.7%	-34.1%	107.8%	362.5%	0.0%	-2.3%	-23.0%	238.3%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	3610	3058	731	220	749	1295	804	0	243	497	66	87	1804	91	64	1071
Scenario B	3609	3058	731	281	749	422	804	0	240	165	66	285	1765	92	64	910
B – A	-1	0	0	61	0	-874	0	0	-4	-332	0	198	-39	0	0	-161
% difference	0.0%	0.0%	0.0%	27.8%	0.0%	-67.5%	0.0%	0.0%	-1.5%	-66.8%	0.6%	229.3%	-2.2%	0.2%	-0.1%	-15.0%

7.3.7 Assignment and transport impacts

Calibrated morning and evening peak base 2015 traffic volumes are shown in Figures 7.4 and 7.5 respectively. As noted previously, strategic traffic volumes, as reported in this section, are for a 2 hour peak period.

Results are presented for the VISUM model coded with 8 trams per hour between Airport and Newhaven.

Scenario A

Forecast future year Scenario A traffic volumes are given in Figure 7.6 and 7.7. These include background growth and all relevant development traffic and proposed mitigation. Difference plots highlighting the change in traffic volumes between 2015 and 2030, for each model period, are presented in Figure 7.8 and 7.9.

In the morning peak, directly to the north of Gogar roundabout, the new link road two-way 2 hour traffic volume is 5,300 vehicles. Evening peak volumes are marginally higher at 5,450 vehicles.

Difference plots show that the new link road provides relief to Eastfield Road with 2030 values forecast to lower than the base year. In the morning peak, traffic flows reduce from 3,370 to 2,400 vehicles; evening peak flows decrease from 3,700 to 2,800 vehicles – a reduction of nearly 30% and 25% respectively.

The link road helps provide relief to the A8 corridor between Gogar and the Eastfield Road dumbbells. Traffic growth is only 2-4% which is much lower than would otherwise be the case.

Scenario B

Forecast future year Scenario B options are illustrated in Figures 7.10 and 7.11. Difference plots compare Scenario A with the Base (Figures 7.12 and 7.13) and with Scenario A (Figures 7.14 and 7.15).

Overall, the pattern of change is consistent with Scenario A, however forecast traffic volumes are reduced. As an example, maximum two-way 2 hour link road traffic volumes are forecast to be 4,600 and 5,000 vehicles in the morning and evening peak, a reduction of 13 and 8% respectively.

Development routing / select link analysis

A series of origin and destination select links have been undertaken on key development zones to understand the routing of future year development trips. These are presented in Appendix D.

As above, analysis assumes Scenario A with 8 trams per hour between the airport and Newhaven.

Each select link highlights the importance of the provision of the new link road in enabling West Edinburgh for development. The majority of airport and IBG traffic to and from Edinburgh and the east uses the new route with traffic to and from the west continues to use Eastfield Rd.

Traffic forecasts and proposed mitigation

In order to cater for a worst case scenario, proposed mitigation has been developed to accommodate Scenario A traffic volumes. In practice, the difference in necessary mitigation between the two options is marginal. Nevertheless, basing the analysis on Scenario A ensures that the package of measures identified is reasonably future proofed and that there is sufficient capacity to cater for future variation in airport growth and the proposed development mix across West Edinburgh.

Figure 7.4: Base 2015 AM 2hr link flows (07:00-09:00)

Figure 7.5: Base 2015 PM 2hr link flows (16:00-18:00)

Figure 7.6: Scenario A 2030 AM 2hr link flows (07:00-09:00)

Figure 7.7: Scenario A 2030 PM 2hr link flows (16:00-18:00)

Figure 7.8: Scenario A – Base AM 2hr difference flows (07:00-09:00)

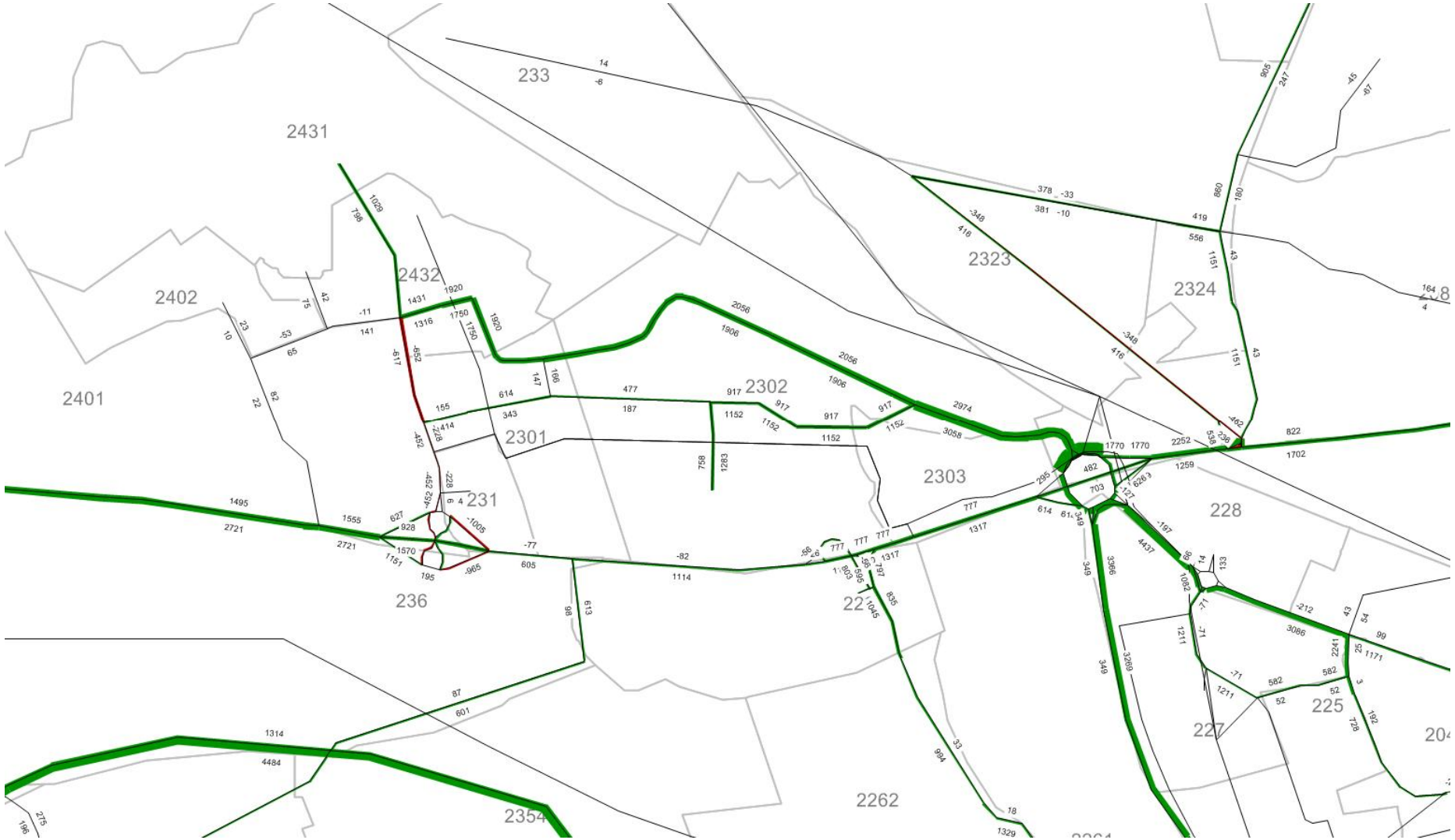

Figure 7.9: Scenario A – Base PM 2hr difference flows (16:00-18:00)

Figure 7.10: Scenario B AM 2hr link flows (07:00-09:00)

Figure 7.11: Scenario B PM 2hr link flows (16:00-18:00)

Figure 7.12: Scenario B – Base AM 2hr difference flows (07:00-09:00)

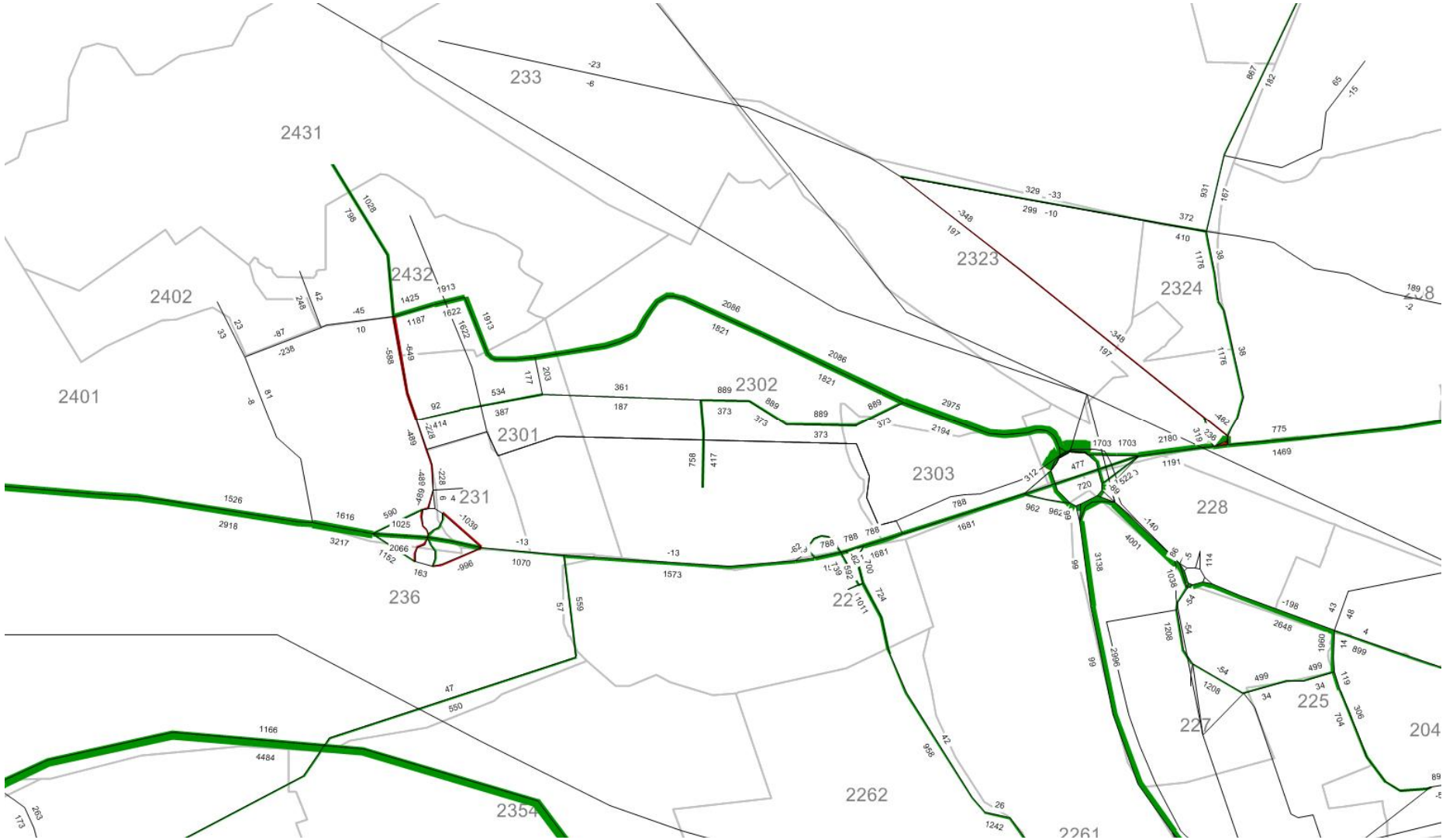

Figure 7.13: Scenario B – Base PM 2hr difference flows (16:00-18:00)

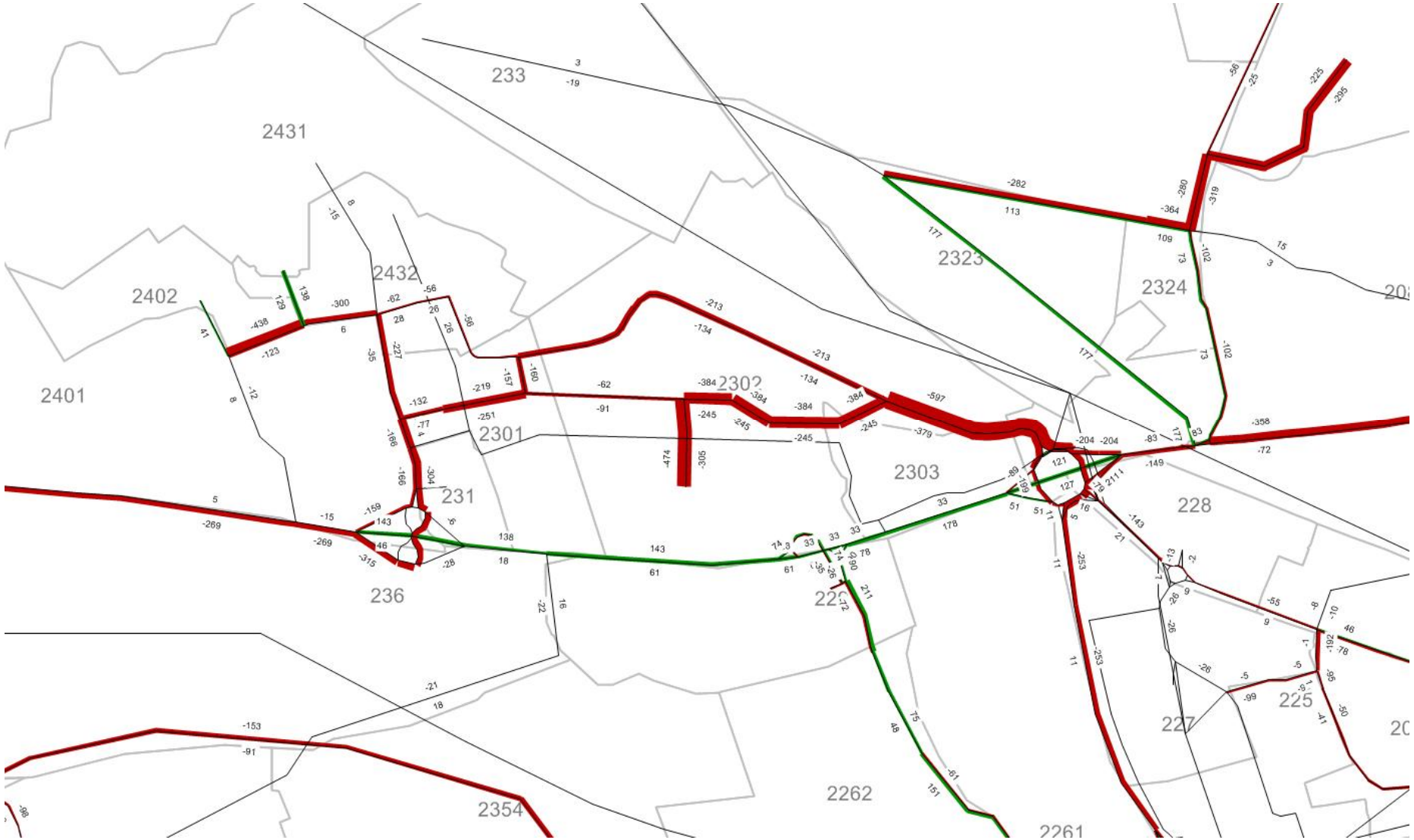

Figure 7.14: Scenario B – Scenario A AM 2hr difference flows (07:00-09:00)

Figure 7.15: Scenario B – Scenario A PM 2hr difference flows (16:00-18:00)

7.3.8 Network performance

Journey times

Base 2015 and forecast 2027 travel times are summarised in Tables 7.7 and 7.8 for the routes illustrated in Figure 7.16 below. As above, forecast times include background growth, development traffic and proposed mitigation.

Analysis is based on Scenario A models and therefore represents a worse-case scenario. Routes have been analysed by direction and include:

- Airport to East of Maybury
- Airport to Hermiston
- M8 to East of Maybury
- A89 to East of Maybury
- M9 to East of Maybury, and
- Maybury Road to Hermiston

Analysis indicates that the provision of the new link roads minimises travel time impacts between the city centre and the Airport / IBG. Travel times are broadly comparable between the 2015 base and 2027 forecast year.

In the morning peak, eastbound journey times between the Airport and East of Maybury increase by only 6%. Westbound times increase by 30%, largely as a result of delays at Maybury junction, although MOVA optimisation will help reduce this. In the evening peak, eastbound journey times increase by 20% compared with the base, again due to queueing on the approach to Maybury. Westbound journey times increase by only 10% in comparison.

Travel times between the Airport / IBG and the A720 are generally comparable with existing network performance. Only evening peak times increase, between the Airport and Hermiston Gait.

Elsewhere, journey times typically increase by around 30% or more in both model periods. Higher increases (up to 60%) are forecast in the evening peak westbound towards Newbridge.

It should be noted that potential additional mitigation measures for Newbridge, developed by WSP | PB, have not been tested in VISUM. These include improved MOVA operation and the removal of the traffic signals on the B7030 (which would revert to priority control).

VISSIM testing indicates that further capacity improvements can be achieved by the proposals. Removal of the B7030 signals simplifies junction operation while providing increased capacity on this approach.

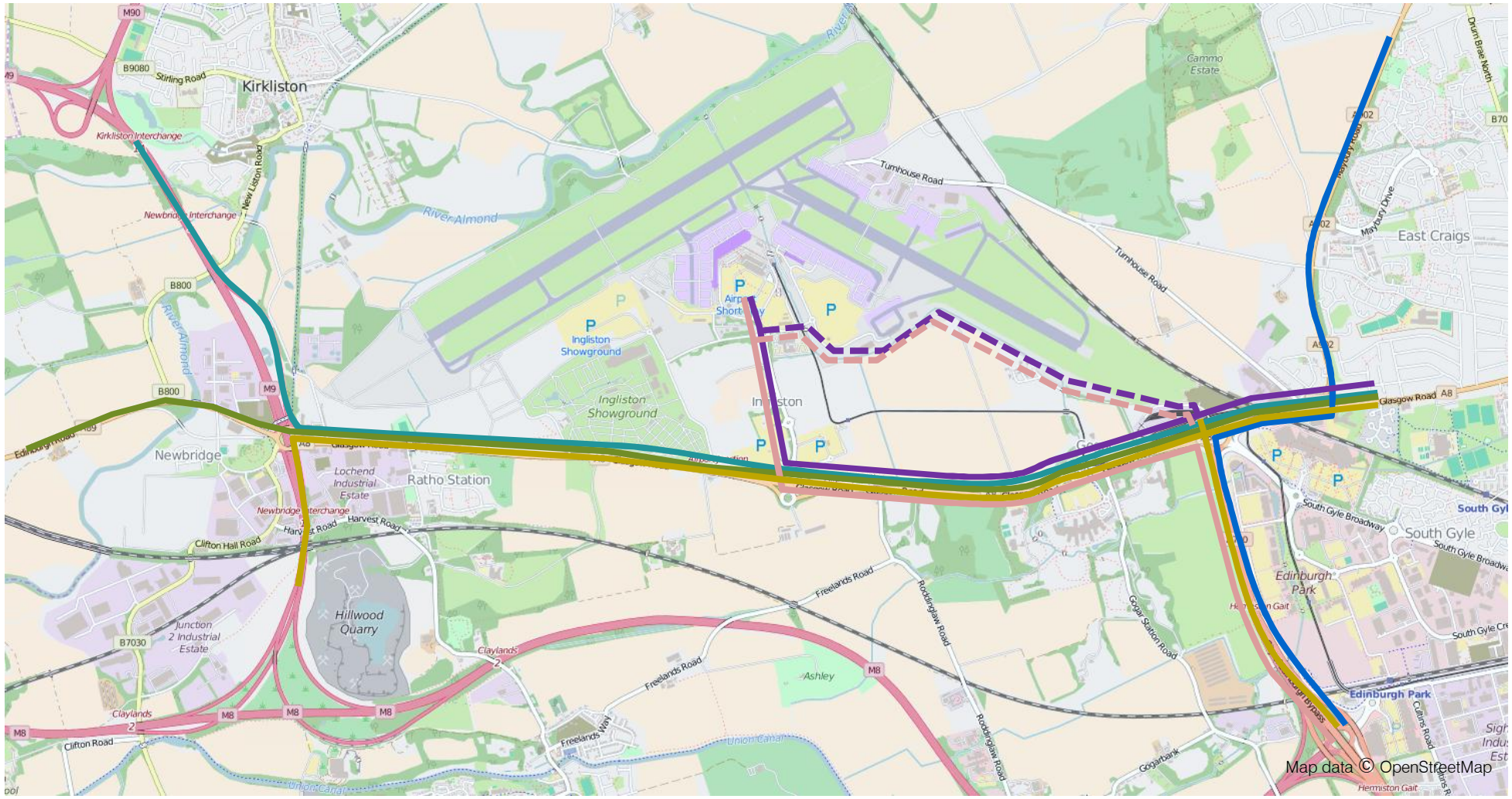

Figure 7.16: Travel time routes

Table 7.7: AM base and future year journey time comparison

		Node (origin)	Node (destination)	Location (origin)	Location (destination)	Model	Length (km)	Travel Time (mm:ss)	Travel time change (%)	vCur (km/h)
1	EB	14555	14659	Airport	A8 East of Maybury Junction	Base	5.01	08:13	6.40%	37
						DS 2027 Newhaven Tram	4.72	08:45		32
	WB	14659	14555	A8 East of Maybury Junction	Airport	Base	5.28	09:00	31.23%	35
						DS 2027 Newhaven Tram	4.98	11:48		25
2	EB	14555	6767	Airport	A720 at Hermiston Gait	Base	5.99	08:11	-7.63%	44
						DS 2027 Newhaven Tram	5.66	07:34		45
	WB	6767	14555	A720 at Hermiston Gait	Airport	Base	5.92	08:18	-15.31%	43
						DS 2027 Newhaven Tram	5.56	07:02		47
3	EB	6834	14659	M8 J2	A8 East of Maybury Junction	Base	8.47	10:41	-2.36%	48
						DS 2027 Newhaven Tram	8.47	10:26		49
	WB	14659	6834	A8 East of Maybury Junction	M8 J2	Base	8.23	08:37	37.33%	57
						DS 2027 Newhaven Tram	8.23	11:50		42
4	EB	14493	14659	A89	A8 East of Maybury Junction	Base	9.68	16:41	36.25%	35
						DS 2027 Newhaven Tram	9.68	22:44		26
	WB	14659	14493	A8 East of Maybury Junction	A89	Base	9.73	12:10	26.59%	48
						DS 2027 Newhaven Tram	9.73	15:24		38
5	EB	6389	14659	M9 J1A	A8 East of Maybury Junction	Base	8.23	09:38	32.94%	51
						DS 2027 Newhaven Tram	8.23	12:48		39
	WB	14659	6389	A8 East of Maybury Junction	M9 J1A	Base	8.43	09:08	34.99%	55
						DS 2027 Newhaven Tram	8.43	12:20		41
6	SB	11747	6767	Barnton Junction	A720 at Hermiston Gait	Base	4.69	08:11	50.16%	34
						DS 2027 Newhaven Tram	4.69	12:17		23
	NB	6767	11747	A720 at Hermiston Gait	Barnton Junction	Base	4.91	06:26	-12.78%	46
						DS 2027 Newhaven Tram	4.89	05:45		52

Table 7.8: PM base and future year journey time comparison

		Node (origin)	Node (destination)	Location (origin)	Location (destination)	Model	Length (km)	Travel Time (mm:ss)	Travel time change (%)	vCur (km/h)
1	EB	14555	14659	Airport	A8 East of Maybury Junction	Base	5.01	08:17	19.59%	36
						DS 2027 Newhaven Tram	4.72	09:54		29
	WB	14659	14555	A8 East of Maybury Junction	Airport	Base	5.28	09:20	11.27%	34
						DS 2027 Newhaven Tram	4.98	10:23		29
2	EB	14555	6767	Airport	A720 at Hermiston Gait	Base	5.99	08:22	16.44%	43
						DS 2027 Newhaven Tram	5.65	09:45		35
	WB	6767	14555	A720 at Hermiston Gait	Airport	Base	5.92	08:47	-18.53%	40
						DS 2027 Newhaven Tram	5.56	07:09		47
3	EB	6834	14659	M8 J2	A8 East of Maybury Junction	Base	4.44	07:22	-17.82%	36
						DS 2027 Newhaven Tram	4.11	06:03		41
	WB	14659	6834	A8 East of Maybury Junction	M8 J2	Base	4.58	08:29	33.70%	32
						DS 2027 Newhaven Tram	4.22	11:20		22
4	EB	14493	14659	A89	A8 East of Maybury Junction	Base	8.47	09:53	28.08%	51
						DS 2027 Newhaven Tram	8.47	12:39		40
	WB	14659	14493	A8 East of Maybury Junction	A89	Base	8.23	09:11	33.42%	54
						DS 2027 Newhaven Tram	8.23	12:15		40
5	EB	6389	14659	M9 J1A	A8 East of Maybury Junction	Base	9.68	14:20	47.31%	41
						DS 2027 Newhaven Tram	9.68	21:07		28
	WB	14659	6389	A8 East of Maybury Junction	M9 J1A	Base	9.73	14:16	65.77%	44
						DS 2027 Newhaven Tram	9.73	23:39		25
6	SB	11747	6767	Barnton Junction	A720 at Hermiston Gait	Base	8.23	08:28	33.18%	58
						DS 2027 Newhaven Tram	8.23	11:16		44
	NB	6767	11747	A720 at Hermiston Gait	Barnton Junction	Base	8.43	10:43	67.81%	52
						DS 2027 Newhaven Tram	8.43	17:59		28

Junction delay

Table 7.9 summarises base 2015 and forecast 2027 average junction delays at major junctions along the A8 corridor, including Maybury Junction, Gogar Roundabout, Eastfield Rd and Newbridge.

Table 7.9 Junction delay

				AM		PM	
	Node	**Road**	**Movement**	**Base - Delay (mm:ss)**	**2027 Newhaven - Delay (mm:ss)**	**Base - Delay (mm:ss)**	**2027 Newhaven - Delay (mm:ss)**
Maybury Junction	505	Maybury Rd	All	02:59	03:13	00:46	00:35
		A8 EB	Straight	00:18	00:50	00:21	00:58
		A8 WB	Straight	00:13	01:56	00:13	01:27
			Right Turn	02:00	02:58	01:12	01:24
	50180	A8 EB	Left Turn	00:18	00:13	00:21	00:26
	50057	Turnhouse Rd	All	00:50	00:52	01:54	00:52
		A8 EB	All	New Junction	00:18	New Junction	01:42
		A8 WB	Right Turn		00:45		00:54
			Straight		02:01		00:13
Gogar Roundabout	11439	A8 WB	Entry	00:20	00:14	00:15	00:18
		Gogar	Circulating	00:01	00:09	00:01	00:01
	11810	Gyle	Entry	00:17	00:16	00:17	03:02
		Gogar	Circulating	00:00	00:01	00:01	00:40
	11814	Bypass	Entry	00:09	00:13	00:07	00:12
		Gogar	Circulating	00:07	00:09	00:07	00:15
	11440	A8 EB	Entry	00:12	00:17	00:14	00:15
		Gogar	Circulating	00:03	00:04	00:01	00:04
	50176	Airport New Rd	Entry	New link	00:49	New link	00:31
		Gogar	Circulating		00:11		00:12
Eastfield Road Dumbbells	12050	A8 WB	Entry	00:08	00:28	00:08	00:25
		Roundabout	Circulating	00:00	00:05	00:00	00:07
	12048	A8 EB	Entry	00:49	00:09	00:14	00:15
		Roundabout	Circulating	00:14	00:21	00:13	00:14
	12047	Eastfield Rd	Entry	00:08	00:07	00:10	00:10
		Roundabout	Circulating	00:20	00:20	00:13	00:21
Newbridge Roundabout	50039	A8 WB	Entry	00:13	00:13	00:19	05:12
		Newbridge	Circulating	00:03	00:08	00:06	00:10
	50041	M9 NB	Entry	00:38	00:33	00:53	00:31
		Newbridge	Circulating	00:03	00:02	00:01	00:05
	50155	B7030	Entry	04:40	04:48	02:19	13:19
		Newbridge	Circulating	00:07	00:07	00:08	00:19
	50034	A89	Entry	00:22	06:30	02:36	06:10
		Newbridge	Circulating	00:05	00:01	00:01	00:02
	50037	M9 SB	Entry	00:35	00:22	00:17	00:18
		Newbridge	Circulating	00:01	00:01	00:01	00:01

The junction delays presented assume an element of blocking back – i.e. that network constraints elsewhere will limit traffic growth. Nevertheless the analysis illustrates that proposed improvements at Maybury are sufficient to maintain a reasonable level of performance through to 2027.

Gogar roundabout also operates satisfactorily with only modest delays on all approach arms. South Gyle Broadway is an important exception with evening peak delays increasing further. This is primarily as a result of the further expansion of Edinburgh Park, although options for further mitigation are limited.

No significant delays are forecast at the Eastfield Road dumbbells, traffic demand being mitigated by the new link road between the Airport / IBG and Gogar.

No major capacity changes are proposed at Newbridge roundabout and as a result delays continue to increase. In the morning peak, approach delays on the A89 and B7030 continue to worsen, signals have been optimised to minimise M8 and M9 approach delays and queueing. Evening peak delays are generally higher on all approach arms. Westbound A8 delays (average across the 2hr model period) are forecast to be approximately four minutes; delays on the A89 and B7030 are estimated to be five and a half minutes and 13 minutes respectively.

While effort has been made to optimise signal timings at Maybury, Gogar and Newbridge, further work in Linsig and TRANSYT will help improve junction performance at these locations.

As noted above, a number of potential additional mitigation measures at Newbridge, developed by WSP | PB, have not been included within the VISUM models. A key proposal is MOVA, which cannot easily be modelled in VISUM, and hence forecast junction delays represent a worst case scenario.

7.4 VISSIM

7.4.1 Demand cordoning

The performance of the A8 corridor with future year development and mitigation has been further tested in VISSIM microsimulation software. Morning and evening peak future year link flows have been cordoned from VISUM and assigned using a previously defined cordoning process, updated to reflect the latest network coding.

The active network elements cordoned are illustrated in Figure 7.17, the VISSIM model network is give in Figure 7.18.

Figure 7.17: Active network area flows cordoned for assignment in VISSIM

Figure 7.18: VISSIM model extents

Demands have been cordoned from Scenario A, representing a worst case scenario. The process creates a series of 15 minute VISSIM matrices for each model period and user class, based on the time profiling given in Table 7.10.

Table 7.10: VISSIM demand profile

AM	Profile	PM	Profile
07:45	0.2365	16:45	0.2314
08:00	0.2580	17:00	0.2592
08:15	0.2600	17:15	0.2519
08:30	0.2470	17:30	0.2460
08:45	0.2350	17:45	0.2429

It should be noted that the VISSIM model has not been fully recalibrated at this stage, although being directly cordoned, they use the latest available count data and turning movements are consistent with Tables 7.3 and 7.4 above.

The purpose of the VISSIM modelling has been to sense check the emerging options rather to be considered as a stand-alone assessment. As an example, the model has been used to help highlight the benefit of improved capacity between Gogar and Maybury and to help discount more complex options at Gogar which did not actually address the primary capacity constraint.

7.4.2 Mitigation coding

The proposed package of 2030 road mitigation has been coded, including:

- The IBG and airport link roads
- Eastfield Rd dualling
- M9 to A8 eastbound slip road improvements
- 2 northbound lanes at the A8 airport dumbbells / A8 westbound off-slip signalisation

Models have then been run to identify further potential issues and improvements.

7.4.3 Model performance

Gogar Station Rd / RBS access

Initial VISSIM runs indicated that, in the morning peak, the junction of Gogar Station Road with the Royal Bank of Scotland is a significant network constraint.

Traffic signal control of the Gogar Station Rd / RBS access and RBS overbridge junctions has been included in the models to increase junction capacity. An example layout is given in Figure 7.19. With this design, local widening to two lanes is required on the majority of approach arms, requiring significant third party land. Despite the increased capacity, queueing is still forecast to occur and signal timings will need to minimise potential impact on the A8.

The layout shown is indicative only, being required to improve VISSIM model performance. Alternative access options should be considered in detail as part of individual planning applications.

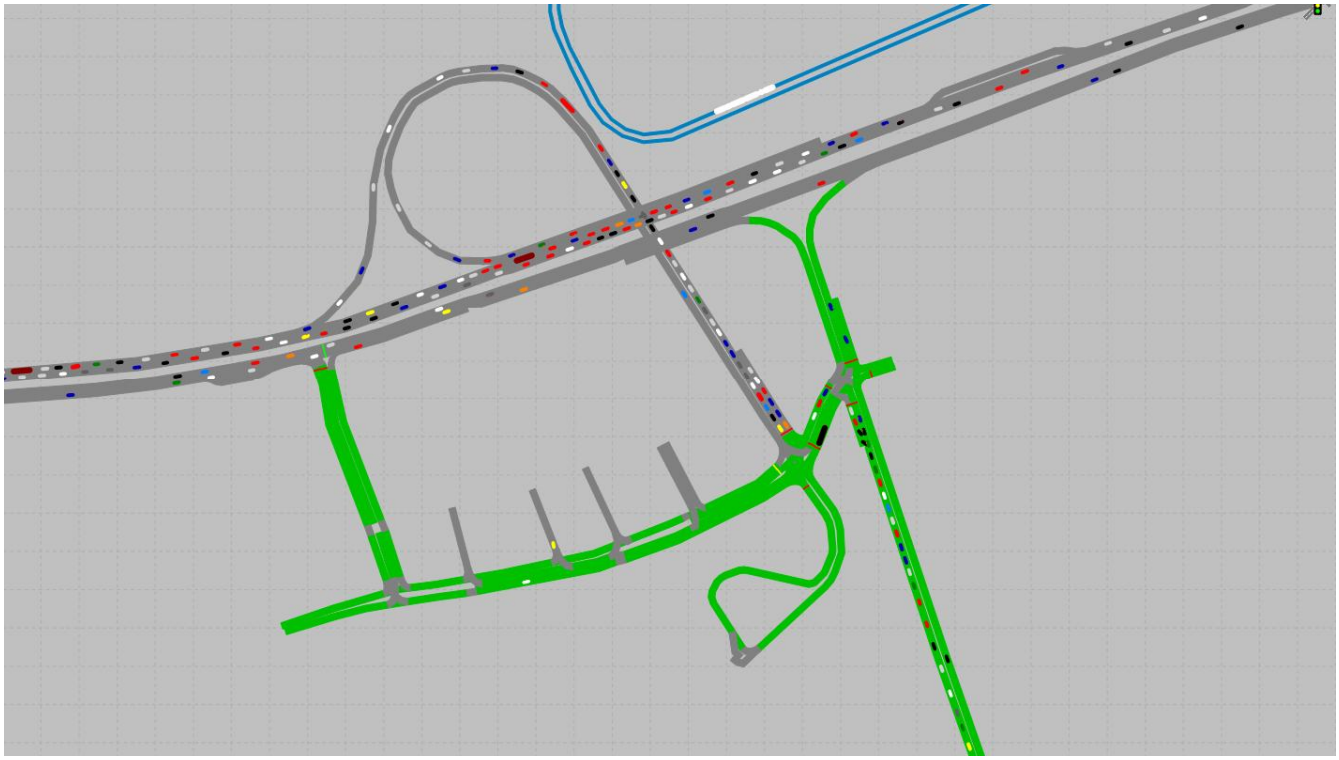

Figure 7.19: Gogar Station Road / RBS junction at 08:25

M9 at Newbridge

Although the M9 to A8 improvements at Newbridge are coded, long queues still occur on the M9 southbound in the morning peak (Figure 7.20). Further mitigation is not recommended as this would only worsen traffic conditions eastbound on the A8.

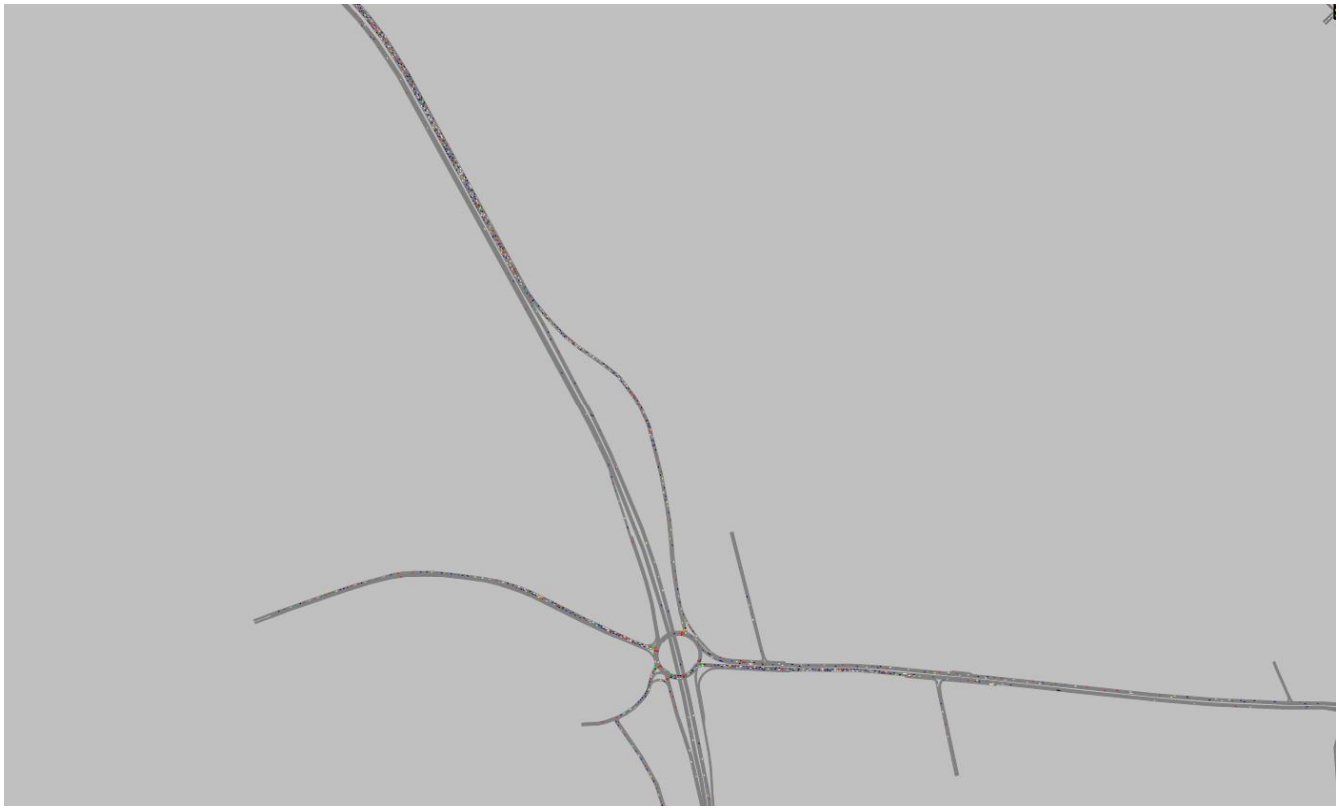

Figure 7.20: Southbound queueing on the M9 at 08:25

Gogar to Maybury

As noted previously, the Gogar to Maybury section of the A8 is a major constraint on the local road network. Eastbound A8 traffic merges with eastbound traffic from the A720 and South Gyle. Traffic then diverges towards the A90 (Barnton) and A8 (city centre). Two underpass lanes and two roundabout lanes merge (total 4) merge into two lanes before diverging to three lanes at Maybury. The resulting weaving movements cause traffic congestion during both morning and evening peak periods.

The constrained two lane section means that the road network through Gogar isn't effectively used. In particular, traffic from the A8 should use the underpass if travelling towards Barnton, but many drivers choose to travel via the roundabout to avoid the potentially difficult merge manoeuvre.

Figure 7.21 illustrates forecast future year evening peak traffic volumes. Queueing back from Maybury results in significant queues and delays along the airport / IBG access, at times reaching the junction with the new street through the IBG development.

By comparison, the provision of a third lane eastbound lane markedly improves network performance. Figure 7.22 shows that although some queueing continues to occurs to the west of Gogar, the underpass and gyratory operate without issue. Only short period queueing occurs on the new link road approach to Gogar, improving egress from the airport and IBG.

Figure 7.21: Gogar to Maybury 2 lanes eastbound, PM peak

Figure 7.22: Gogar to Maybury 3 lanes eastbound, PM peak

8. Appraisal of Refreshed Package

8.1 Appraisal against planning objectives

The recommended Refresh Package has been appraised qualitatively against the refreshed Planning Objectives set out earlier in this report. This appraisal is set out in Table 8.1 below.

The appraisal demonstrates a significantly stronger fit of the package of measures in addressing the refreshed objectives than the original 4c package from the 2010 WETA Study. Whilst a number of key elements of the roads based package remain, e.g. interventions at Newbridge and Gogar, the better definition of cycling schemes and a number of additional bus priority, bus interchange and park and ride schemes help address both accessibility and mode share objectives more strongly. The key addition of demand management measures in the form of strong parking controls and monitoring also increases the effectiveness of the total package in addressing the objectives.

8.2 Appraisal against STAG criteria

The purpose of this section is to provide a brief, high level qualitative assessment of the West Edinburgh transport and active travel improvements package within this Refresh Study in relation to STAG criteria. Whilst this is not a STAG appraisal, it was felt to be helpful to provide a high level comparison against the findings and conclusions from the 2010 West Edinburgh Transport Appraisal (WETA).

. The five STAG criteria are:

- Accessibility & Social Inclusion;
- Economy;
- Environment;
- Integration; and
- Safety.

Note that only the Community Accessibility element of the Accessibility and Social Inclusion criteria has been considered. The Comparative Accessibility element [i.e. distribution of impacts] has not been considered. In addition, whilst transport integration has been considered, integration with land-use or transport policy has not been considered.

Table 8.1 Key

Strongly address objective or movement	
Address objective or movement	
Neutral	
Some conflict with objective/movement	
Major conflict with objective	

Table 8.1: WETA Refresh (2016) Revised Package Appraisal against Refreshed Objectives

WETA Refresh (2016) Revised Package	To support West Edinburgh Planning Framework growth through:						Movement addressed			
	Reduce variability of journey times and improve overall journey times for PT	To minimise and mitigate environmental impacts on local communities	Maximise mode share by walking, cycling and PT (min 50% mode share)	Improve accessibility to; through and within the area	Ensure transport system has resilience to handle foreseeable major events and incidents	Protect and enhance the natural and built environment of the W. Edinburgh area	City	West	South	North
Cycling Measures										
Fill cycleway gaps and improve existing cycleways along A8 between Gogar and Newbridge Roundabouts	Reduced journey times with continues and improved cycleways. No effect on PT journey times.	Lower C02 per trip, lower road noise; filling gaps and improving cycleways decreases the significance of A8 as a barrier to cycling.	Measure contributes to active travel modal goals	Measure improves accessibility of cycling along A8	Measure encourages mode shift to active travel, thereby improving overall resilience of local transport system	Measure is identified in the SESTran Strategic Cross-Boundary Cycle Development Report.				
Pathway improvements Newbridge to Dalmeny via Kirkliston	Paving, widening and drop kerb improvements will decrease journey times. No effect on PT journey times.	Lower C02 per trip, lower road noise; improving this path decreases the severance caused by the Edinburgh Airport.	Measure contributes to active travel modal goals	Measure improves accessibility of cycling along this route and cycling accessibility between Newbridge and Kirkliston / Dalmeny / Queensferry	Route is part of an integrated network of cycle paths and can be more useful if improved.	Measure is identified in the SESTran Strategic Cross-Boundary Cycle Development Report.				
Cycle connection A8 to Edinburgh Airport	Dedicated cycle lane or path to airport where none currently exists would improve cycling journey times. Assumed to not impact PT journey time.	Measure serves to increase cycling trips, thereby reducing CO2 and lowering road noise.	Measure contributes to active travel modal goals	Measure improves cycling accessibility between Edinburgh Airport and the A8.	Serves to connect a key destination with a dedicated cycle route, thereby supporting a more robust and resilient transportation system.	Measure is identified in the West Edinburgh Transport Appraisal and the SESTran Strategic Cross-Boundary Cycle Development Report.				

WETA Refresh (2016) Revised Package	To support West Edinburgh Planning Framework growth through:						Movement addressed			
	Reduce variability of journey times and improve overall journey times for PT	To minimise and mitigate environmental impacts on local communities	Maximise mode share by walking, cycling and PT (min 50% mode share)	Improve accessibility to; through and within the area	Ensure transport system has resilience to handle foreseeable major events and incidents	Protect and enhance the natural and built environment of the W. Edinburgh area	City	West	South	North
Improved access from West Craigs to Edinburgh Gateway via new rail overbridge	May improve cycling journey times, depending on type of infrastructure used. Assumed to not impact PT journey time.	Measure serves to increase cycling trips, thereby reducing CO2 and lowering road noise.	Measure contributes to active travel modal goals	Measure improves cycling accessibility between East Craigs area and A8, and seeks to connect to NCR-1.	Serves to integrate East Craigs into larger cycling network, thereby improving resilience of overall local transport system.	This measure is identified in the SESTran Strategic Cross-Boundary Cycle Development Report as a missing cycling link between A-8 and NCR-1 by way of Maybury Road.				
Improved access Ratho Station to A8 along Station Road	Dedicated cycle infrastructure may provide more efficient and faster cycling journey. Assumed to not impact PT journey time.	Measure serves to increase cycling trips, thereby reducing CO2 and lowering road noise.	Measure contributes to active travel modal goals	Ratho cycling accessibility would be improved.	Serves to improve a designated cycle route with dedicated infrastructure and increase cycling trips, thereby improving resilience of overall local transport system.	Active travel is a key component of relevant planning documents.				
Turnhouse / Maybury Rd improved crossing	May result in improved and more consistent journey times. Assumed to not impact PT journey times.	Measure serves to increase cycling trips, thereby reducing CO_2 and lowering road noise.	Measure contributes to active travel modal goals	Cycle accessibility along the A8 cycle path would improve.	Measure serves to improve the A8 cycle path, thereby improving resilience of the overall local transport system.	Active travel is a key component of relevant planning documents.				
Toucan Crossing Improved bridge access at Station Road/A8	Improved crossing would decrease cycle journey times.	Measure serves to increase cycling trips, thereby reducing CO_2 and lowering road noise. Improved access helps to overcome currently inaccessible bridge.	Measure contributes to active travel modal goals	Measure directly improves accessibility for cyclists.	Measure serves to improve access to A8 cycle paths, thereby improving resilience of the overall local transport system.	Measure is identified in the A89/A8 Corridor Public Transport Improvement Study.				

WETA Refresh (2016) Revised Package	To support West Edinburgh Planning Framework growth through:						Movement addressed			
	Reduce variability of journey times and improve overall journey times for PT	To minimise and mitigate environmental impacts on local communities	Maximise mode share by walking, cycling and PT (min 50% mode share)	Improve accessibility to; through and within the area	Ensure transport system has resilience to handle foreseeable major events and incidents	Protect and enhance the natural and built environment of the W. Edinburgh area	City	West	South	North
Public Transport Measures										
A89/A8 Bus Priority	Significant benefit for bus reliability. Does not remove capacity for car	Improved Bus flow reducing emissions	Improved PT journey time and reliability make bus more attractive. Complemented by linked improvements in cycle facilities	Improves accessibility by PT to and from West Edinburgh to West Lothian	Bus lanes can be used by additional PT services for major events and emergency vehicles (and other traffic if required) during incidents	Some land take/visual impact				
Bus link from RBS to IBG (not being taken forward)	New bus priority corridor provides reliability benefits.	Improved Bus flow reducing emissions but other environmental issues apply.	Improved PT journey times and reliability making bus more attractive.	Provides new connectivity between the airport / IBG and south west Edinburgh.	Provides alternative connectivity between West Edinburgh and the wider PT network	Major impact on designated historic conservation site.				
Improved bus priority linking South West Edinburgh with the Gyle, IBG and airport	PT reliability benefits to key local centres	Improved Bus flow reducing emissions	Improved PT journey times and reliability making bus more attractive.	Provides new connectivity between the airport / IBG and south west Edinburgh.	Bus priority can be used by emergency vehicles (and other traffic if required during incidents)	Local land take / visual impact but generally minor.				
Kilpunt Park and Ride	Opens up new opportunities for car and cycle interchange with bus to reduce overall journey times with key PT element in association with linked bus priority.	Encourages use of bus with potential benefits to emissions. Some local landscape impact from new facility.	Opens up new PT journey options through interchange with new modes and high quality PT facility.	Opens up accessibility to West Edinburgh for areas without direct PT services through car, cycle and bus interchange	Potential to use for major events particularly at weekends	Some visual impact from new facility in Kilpunt area.				

WETA Refresh (2016) Revised Package	To support West Edinburgh Planning Framework growth through:						Movement addressed			
	Reduce variability of journey times and improve overall journey times for PT	**To minimise and mitigate environmental impacts on local communities**	**Maximise mode share by walking, cycling and PT (min 50% mode share)**	**Improve accessibility to; through and within the area**	**Ensure transport system has resilience to handle foreseeable major events and incidents**	**Protect and enhance the natural and built environment of the W. Edinburgh area**	**City**	**West**	**South**	**North**
Ingliston Bus Interchange and upgraded park and ride	Improved opportunities for bus to bus, bus to tram and park and ride interchange benefitting PT journey times	Encourages use of bus with potential benefits to emissions. Some local landscape impact from extended new facility	Opens up new PT journey options through improved interchange between PT services and park and ride and higher quality facility.	Opens up accessibility to and from West Edinburgh for areas without direct PT services through bus/bus, bus/tram park and ride interchange	Additional capacity for bus services for major events and park and ride capacity	Some visual impact from extended facility although new-built form could enhance built environment				
New Tram Halt	Opens up access to high frequency tram services for new development at IBG	Encourages use of tram with potential benefits to emissions. Minimal local landscape impact on existing line	Opens up new PT journey options by tram and tram interchanging with bus and rail (Edinburgh Gateway and Edinburgh Park) and park and ride.	Opens up accessibility to and from major area of IBG site with tram network and interchange options	Limited impact	Very limited local impact of new halt on existing line. Can integrate with wider masterplan proposals				
Parking Control/Demand Management										
Parking control/Demand management	Restricts car movements with consequential benefits for journey time reliability for other road users and particularly bus	Reduces car movements to and from West Edinburgh benefitting local communities	Strongly supports mode shift to public transport, cycling and walking	Makes PT options more attractive helping stimulate additional services which can provide greater accessibility to, from and within the area	Helps control mode share encouraging PT and active travel options which can provide greater resilience for major events and incidents	Potential to significantly reduce environmental impacts of development growth allowing higher quality masterplanned environments in line with latest policy				

WETA Refresh (2016) Revised Package	To support West Edinburgh Planning Framework growth through:						Movement addressed			
	Reduce variability of journey times and improve overall journey times for PT	To minimise and mitigate environmental impacts on local communities	Maximise mode share by walking, cycling and PT (min 50% mode share)	Improve accessibility to; through and within the area	Ensure transport system has resilience to handle foreseeable major events and incidents	Protect and enhance the natural and built environment of the W. Edinburgh area	City	West	South	North
Road Measures										
Newbridge additional lane from M9 onto A8	Additional capacity will help mitigate car congestion. Small improvement in car and bus journey time reliability, but this will be eroded as traffic growth continues.	Limited impact	No direct impact Public transport priority is already provided on the M9 approach to the A8 at Newbridge.	Minor improvement in access from the M9, including West Lothian and Fife	Increases network capacity and improves performance of strategic road network. Care needs to be taken not to improve dramatically otherwise queueing will relocate to the A8. Some capacity restraint remains desirable at this location	Some land take/visual impact				
MOVA improvements at Newbridge / Dumbbells Gogar / Maybury										
Link Road Section 1 Dual from Gogar to IBG	Reduces journey time variability by all road modes and with bus priority should assist PT journey times	Limited impact	Promotes PT mode share	Provides access to new development at IBG and provides second access to airport	Significant benefits for resilience (and futureproofing) for airport and events/incidents	If appropriately designed should help secure wider masterplanning objectives for Airport / IBG area				
Link Road Section 2 IBG to Airport	Reduces journey time variability by all road modes and with bus priority should assist PT journey times	Limited impact	Promotes PT mode share	Provides second access to airport and enables reconfiguration of terminal area and land / airside development.	Significant benefits for resilience (and futureproofing) for airport and events/incidents	If appropriately designed should help secure wider masterplanning objectives for airport area				

WETA Refresh (2016) Revised Package	To support West Edinburgh Planning Framework growth through:						Movement addressed			
	Reduce variability of journey times and improve overall journey times for PT	To minimise and mitigate environmental impacts on local communities	Maximise mode share by walking, cycling and PT (min 50% mode share)	Improve accessibility to; through and within the area	Ensure transport system has resilience to handle foreseeable major events and incidents	Protect and enhance the natural and built environment of the W. Edinburgh area	City	West	South	North
Link Road Section 3 IBG main street to Eastfield Road	Reduces journey time variability by all road modes and with bus priority should assist PT journey times	Limited impact	Promotes PT mode share and cycling improvements could also be accommodated	Significantly opens up accessibility through, within and to the West Edinburgh Area and Airport	Minor benefits for resilience (and futureproofing) for airport and events/incidents	If appropriately designed should help secure wider masterplanning objectives for IBG area				
A8 Gogar Roundabout – 4 Lane Northern Circulatory Improvement	Reduces journey time variability by all road modes but limited impact on PT journey times	Some negative impacts e.g. severance in immediate vicinity but improved flows could have some air quality benefits	Doesn't specifically address Cycling and PT mode share	Doesn't directly improve accessibility to, through and within the area	Some increase in capacity should assist	Some negative impact on environment in immediate vicinity of Gogar but some benefits along A8 corridor				
Gogar to Maybury additional eastbound traffic lane	Additional eastbound capacity improves network performance, improving reliability and PT journey times	Some impact on adjacent properties.	Helps maintain PT journey times, potential for improved walking and cycling provision	Improves accessibility between West Edinburgh and the rest of the city	Benefits for network resilience.	Some land take/visual impact				
Dualling of Eastfield Road	Reduces journey time variability by all road modes and with bus priority should assist PT journey times	Some impact on existing properties on and adjacent to Eastfield Road	Provides new high quality cycle links to airport and development sites. Enables additional bus priority	Improves accessibility to new development areas and Airport	Benefits for resilience (and futureproofing) for airport and events/incidents	Impact of additional built form but opportunity to provide high quality streetscape in line with policy				
Dumbbells Roundabout Improvement (two lanes northbound)	Reduces journey time variability by all road modes and with bus priority should assist PT journey times	Limited impact	Helps maintain PT journey times towards Eastfield Rd	Improves accessibility to Eastfield Road and Airport	Benefits for resilience (and futureproofing) for airport and events/incidents	Minor land take/visual impact				

8.3 Method of Approach

The previous work undertaken in 2010 has provided the basis from which to compare the emerging improvements package. High level summaries covering each STAG criteria have been obtained from the 2010 WETA Package 4c and are shown in Table 8.2 below.

A qualitative assessment against the five STAG criteria has then been undertaken taking cognisance of the recommended 2016 improvements package. This is shown in Table 8.3.

Finally, potential changes, and reasons for those changes, between the 2016 recommended package and the 2010 WETA Package 4c in relation to the STAG criteria are described in Table 8.4.

Table 8.2: WETA (2010), Package 4C, Performance against STAG Criteria

STAG Criteria	Key Positives		Key Negatives			BCR (P50 costs), 60 year appraisal		Accidents cost / relative to Reference, £,000 over 60 years			
Accessibility & Social Inclusion	• Alternative access to Edinburgh Airport and IBG via Gogar link. • Improved walking and cycling network internal to development area and also links to wider network. • Public transport access enhanced through bus priority and increased capacity on key corridors.		Access from the west via A8 corridor only			-		-			
Integration	• Interchange opportunity at Gogar. • Bus priority could be achieved with road capacity enhancements and signal improvements on A8, Newbridge, Gogar, Eastfield Road and Dumbbells		Additional road capacity enables greater levels of car travel which could compromise modal share targets			-		-			
Economy	-		-			8.2		-			
Safety	-		-			-		-38,000			
Environment	**Cultural Heritage**	**Water Quality, Drainage & Flood Defence**	**Agriculture and Soils**	**Biodiversity**	**Landscape**	**Visual Amenity**	**Geological Resources**	**NO_2**	**PM_{10}**	**CO_2**	**Noise**
	Minor to Moderate Adverse	Minor to Moderate Adverse	Moderate to Major Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse	Negligible	+59,900	+1,500	-1,9m	298 additional people annoyed

Table 8.3: WETA Refresh (2016), Emerging Strategy, Performance against STAG Criteria

STAG Criteria	Key Positives	Key Negatives	BCR (P50 costs), 60 year appraisal	Accidents cost / relative to Reference, £,000 over 60 years
Accessibility & Social Inclusion	Road Improvements: • Alternative access to Edinburgh Airport and IBG via new Airport Gogar Link road/Main Street PT Improvements: • Upgraded Bus interchange facility at Ingliston P&R • Bus priority eastbound and westbound on A8 • Potential bus priority from South West Edinburgh (Heriot Watt/Hermiston) to Gyle / West Edinburgh • New Kilpunt Park and Ride Active Travel Improvements: • A8 North side missing link • Cycle connection from A8 along Eastfield Road into Airport • Improved access between Ratho Station and A8 along Station Road • Improved walking and cycling network internal to development and also links to wider network	Access to Airport and IBG from the west via A8 corridor only Potentially increased severance across A8 arising from additional lane measures Minor impacts on SIMD?	Not possible to quantify at this stage (although VISUM and VISSIM modelling and TRACC analysis provides basis for future detailed assessment)	- Not possible to quantify at this stage
Integration	• Improved/new Interchange at Gogar, Ingliston and Kilpunt • Improved road, PT and active travel connections and interchanges could facilitate a more 'seamless' transport network • Bus priority could be achieved with road capacity and signal improvements on A8, Newbridge, Gogar, Eastfield Road and Dumbbells	Additional road capacity enables greater levels of car travel (although with increased overall travel demand) which could compromise modal share targets	Not possible to quantify at this stage -	- Not possible to quantify at this stage
Economy	-	-	Not possible to quantify at this stage	-
Safety	-	-	-	Not possible to quantify at this stage

Environment *(impact during operation)*	Cultural Heritage	Water Quality, Drainage & Flood Defence	Agriculture and Soils	Biodiversity	Landscape	Visual Amenity	Geological Resources	NO_2	PM_{10}	CO_2	Noise
	Minor to Moderate Adverse	Minor to Moderate Adverse	Moderate to Major Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse	Negligible	Not possible to quantify at this stage			

Table 8.4: STAG Criteria, WETA Refresh (2016) vs. WETA (2010)

STAG Criteria	Potential Change	Reason(s)
Accessibility & Social Inclusion	Improvement	Better understanding and consideration of travel movements within the region could lead to an improved package of transport measures Greater focus on public transport and active travel improvements could have a greater impact on socially excluded people groups
Integration	Improvement	Greater focus on public transport and active travel improvements Increased number of interchange proposals / opportunities, including Kilpunt
Economy	Not possible to quantify	Necessary analytical tools and information are not available
Safety	Not possible to quantify	Necessary analytical tools and information are not available
Environment	No Change	Currently there is little evidence to suggest that the emerging package will affect conclusions drawn from the 2010 WETA study. The potential environmental impacts and any proposed mitigation measures are very much dependent on the package of measures being taken forward and until those are fully developed, it is difficult to determine, even in qualitative terms, whether the emerging package would perform better or worse against the environment criteria. However, given that the emerging package has a greater focus on public transport and active travel compared to the 2010 WETA study, it is reasonable at this stage to suggest that there may be some improvement to the environmental impacts highlighted by the previous study.

9. Costing of Infrastructure Package

9.1 Costing of infrastructure

The total cost of the infrastructure package has been estimated to be £108,191,000 including a 44% optimism bias.

Costs have been calculated using the Civil Engineering and Highway Works Price Book 2016 (SPONS); a more detailed summary of each infrastructure measure is given in Appendix E.

Table 9.1: Costing of infrastructure package

Infrastructure measure	Potential cost excluding optimism bias	Potential cost including 44% optimism bias
Cycling		
A8 north side missing link	£537,500	£773,900
Improvements to Gravel path (old railway line) from A8/M9 interchange north to Kirkliston	£317,600	£457,300
Cycle Connection from A8 along Eastfield Road into Airport	£481,500	£693,300
New pedestrian / cycle bridge over railway between West Craigs and Edinburgh Gateway	£3,000,000	£4,320,000
Improved Crossings at Turnhouse Road and Maybury Road for designated cycle path	£110,000	£158,400
Improved access between Ratho Station and A8 along Station Road	£458,200	£659,800
Improved Station Road/A8 access for cyclists	£440,800	£634,800
Total	**£5,345,600**	**£7,697,500**
Public transport		
Broxburn to Newbridge Roundabout bus lane	£3,124,700	£4,499,600
Station Road to Newbridge Interchange bus lane	£1,112,700	£1,602,300
A8 Eastbound Bus Lane from Dumbbells to Maybury Junction	£2,567,700	£3,697,400
Bus Lane under Gogar Roundabout	£64,100	£92,300
Maybury Road Approach to Maybury Junction	£2,140,400	£3,082,200
Improved bus priority linking South West Edinburgh with the Gyle, IBG and airport (including pedestrian / cycle facilities where appropriate)	£4,480,200	£6,451,500
Upgraded Bus interchange facility at Ingliston P+R	£3,000,000	£4,320,000
Kilpunt Park and Ride	£5,500,000	£7,920,000
New Tram Stop	£1,000,000	£1,440,000
Total	**£22,989,800**	**£33,105,400**
Road		
Link Road Part 1 Dual Carriageway	£6,301,000	£9,073,400
Link Road Part 2 Single Carriageway	£2,813,900	£4,052,000
Segregated Link Road cycle route	£1,115,000	£1,605,600
Development Link Road Main Street Carriageway	£5,634,900	£8,114,300
Dualling of Eastfield Road Phase 1	£1,802,900	£2,596,100
Dualling of Eastfield Road Phase 2	£1,143,000	£1,645,900
Dumbbells Roundabout Improvement	£1,203,000	£1,732,400
Dumbbells westbound off-slip signals	£865,200	£1,245,900
MOVA improvements at Newbridge, Dumbbells, Gogar/Maybury	£1,510,000	£2,174,400
Newbridge additional lane from M9 onto A8	£581,300	£837,100
A8 Gogar Roundabout – 4 lane northern circulatory improvement	£1,699,200	£2,446,800
Gogar to Maybury additional eastbound traffic lane	£20,833,300	£30,000,000
CEC Maybury improvement scheme	£1,294,500	£1,864,100
Total	**£46,797,200**	**£67,388,000**
Grand total	**£75,132,600**	**£108,190,800**

The values above include design and construction costs but generally exclude land purchase.

A number of schemes are outline in nature at this stage. Further work is being undertaken to refine and define the deliverability and cost of the most complex measures. The key examples within this category are:

- improved bus priority linking south west Edinburgh with the Gyle and IBG
- Gogar to Maybury additional eastbound traffic lane, and
- further design / development of the Link Road / Main Street.

10. Phasing of Infrastructure Package

10.1 Introduction

To be eligible for City Deal funding, all schemes must be implemented or under construction within a 10 year period from the start of the agreement. Two forecast years have therefore been considered; schemes ready by 2022 and schemes ready by 2027, approximating to a 5 year and 10 year position.

In developing the phasing strategy, a key aim has been to maximise public transport, walking and cycling mode share from the outset. Achieving this requires the early provision of high quality infrastructure and the recommended phasing strategy reflects this objective. A summary of the phasing of individual measures is given in Table 10.1.

Table 10.1: Phasing of infrastructure package

Year	By 2022	By 2027
Cycling		
A8 north side missing link	Y	
Improvements to Gravel path (old railway line) from A8/M9 interchange north to Kirkliston	Y	
Cycle Connection from A8 along Eastfield Road into Airport	Y	
New pedestrian / cycle bridge over railway between West Craigs and Edinburgh Gateway	Y	
Improved Crossings at Turnhouse Road and Maybury Road for designated cycle path	Y	
Improved access between Ratho Station and A8 along Station Road	Y	
Improved Station Road/A8 bridge access for cyclists	Y	
Public transport		
Broxburn to Newbridge Roundabout bus lane	Y	
Station Road to Newbridge Interchange bus lane	Y	
A8 Eastbound Bus Lane from Dumbbells to Maybury Junction		Y
Bus Lane under Gogar Roundabout	Y	
Maybury Road Approach to Maybury Junction		Y
Improved bus priority linking South West Edinburgh with the Gyle, IBG and airport (including pedestrian / cycle facilities where appropriate)		Y
Upgraded Bus interchange facility at Ingliston P+R		Y
Kilpunt Park and Ride	Y	
New Tram Stop	Y	
Road		
Link Road Part 1 Dual Carriageway	Y	
Link Road Part 2 Single Carriageway	Y	
Segregated Link Road cycle route	Y	
Development Link Road Main Street carriageway	Y	
Dualling of Eastfield Road Phase 1	Y	
Dualling of Eastfield Road Phase 2	Y	
Dumbbells Roundabout Improvement	Y	
Dumbbells westbound off-slip signals	Y	
MOVA improvements at Newbridge, Dumbbells, Gogar/Maybury	Y	
Newbridge additional lane from M9 onto A8	Y	
A8 Gogar Roundabout – 4 lane northern circulatory improvement	Y	
Gogar to Maybury additional eastbound traffic lane	Y	
CEC Maybury improvement scheme	Y	
Total (including 44% optimism bias)	**£90,639,700**	**£17,551,100**
Cumulative Total (including 44% optimism bias)	**£90,639,700**	**£108,190,800**

10.2 Cycling

All identified cycling measures are recommended for implementation by 2022. These include the critical missing link of the A8 cycle route on the north side of the carriageway.

10.3 Public transport

By 2022

New public transport infrastructure will be delivered as development requires. The aim is to ensure that all necessary infrastructure is in place in order to encourage sustainable travel from the outset.

It is proposed that bus priority improvements at Newbridge are implemented in the near term. These are consistent with wider strategic objectives of improving regional public transport connectivity and prioritising public transport as part of the Queensferry Crossing opening.

New bus lanes would be provided on the A89 eastbound and A8 westbound approaches to Newbridge, consistent with the A89/A8 Corridor – Public Transport Improvement Study. Kilpunt Park & Ride could be developed in conjunction with this scheme.

An eastbound bus lane, through the underpass at Gogar is a simple and low cost intervention that can be readily delivered. Similarly, the majority of infrastructure required for a new tram stop at IBG is already in place and so a new stop should be implemented, in discussion with the tram operator, as development necessitates.

By 2027

Public transport improvements at Maybury are proposed to be implemented after 2022. A new southbound bus lane on Maybury Road will improve public transport connectivity from the north. Nevertheless, it is a relatively costly scheme and this should be implemented once there are a sufficient number of bus services using the corridor. The A8 eastbound bus lane, between the Airport junction and Gogar would also be constructed at a later stage, once the pattern of bus services using the A8 and the new development road network is understood.

The upgraded bus and tram interchange at the Ingliston Park and Ride site is a medium term intervention incorporating improvements to facilitate bus to bus interchange as well as the quality of bus and tram waiting facilities (including improved shelter).

10.4 Road

Given existing road congestion the strong interrelationship between the various roads measures and the importance of improving journey time reliability to and within West Edinburgh, it is recommended that the full package of road measures is delivered within the first five years of the programme.

It is important that the new link road/main street package be constructed as soon as possible within the phasing of infrastructure. Early delivery of the Link Road/Main Street would provide network resilience benefits to the airport while opening up significant land for development within the city deal period. Collaboration between the Airport, landowners and the Council is encouraged to facilitate prompt delivery of this key infrastructure providing new links between Eastfield Road and the Airport through to the Gogar Roundabout. Whilst hopefully not required, the Council's CPO powers can be used to assist with the delivery of infrastructure on land that it does not own, where a landowner is reluctant to deliver the action themselves. Local improvements at Gogar, including the provision of a 4th northbound lane across the western overbridge, complement the Link Road/Main Street scheme and could be implemented at the same time.

Construction of the Link Road/Main Street package would greatly assist in mitigating the impacts of construction for dualling Eastfield Road which should also be an early intervention. This would ideally be combined with Stage 1 of the dumbbell improvement. This includes the provision of a second northbound traffic lane under the existing underpass. Whilst the presumption would be that dualling would not occur until the Link Road/Main Street is built this could be reviewed if satisfactory arrangements are provided.

The construction of an additional eastbound lane between Gogar and Maybury is also recommended as an early intervention. Increased eastbound capacity towards Maybury Junction enables more efficient use of existing

infrastructure at Gogar. In particular, it will allow more effective use of the A8 underpass, while unlocking roundabout capacity.

MOVA (Microprocessor Optimised Vehicle Actuation) improvements at Maybury / Gogar and the Dumbbells would be implemented. Traffic modelling indicates that it will also be necessary to signalise the westbound off slip at the southern dumbbell circulatory carriageway at a later stage (before 2027).

MOVA has already been implemented at Newbridge, resulting in an increase in junction capacity. Further improvements are possible and these can be implemented over the five year programme. The scheme to improve capacity from the M9 off-slip to the A8 at Newbridge, is a relatively low cost intervention which can be developed and implemented at an early stage.

10.5 Site Specific Transport Assessments and Local Development Measures

This Refresh Study models and promotes the strategic transportation infrastructure deemed necessary to implement and support the wider development in the West Edinburgh area within the horizon up to 2030. As part of the planning process for individual developments within the area, separate Transport Assessments will be required for site specific issues. Further detailed traffic and transportation analysis should be undertaken within these analyses to clearly demonstrate that the development and any associated measures meet the objectives set by this Refresh Study. This will be important for all developments but particularly for any development taking place before the additional Refresh infrastructure measures already described in this report are in place.

Any measures should be in line with the principles of high quality masterplanning and place making set out for West Edinburgh. The analysis, with associated modelling, will need to demonstrate that there is sufficient capacity to accommodate any earlier phases of development in West Edinburgh, in advance of the strategic infrastructure being in place. This should be facilitated by appropriate early site or phase specific local transport interventions, without any significant adverse impacts on existing road, active travel or public transport users.

11. Funding Models

11.1 Introduction

This chapter summarises potential contribution mechanisms from developers and other trip generators. It also considers the potential for City Deal investment to contribute to the overall package of measures.

11.2 Potential Contribution Mechanisms

11.2.1 Planning Context

The City of Edinburgh Council's policies and proposals relating to the development and use of land in the Edinburgh area are set out in the Edinburgh Local Development Plan Second Proposed Plan dated September 2016 ("the LDP"). The LDP replaces two local plans - Edinburgh City Local Plan and Rural West Edinburgh Local Plan.

West Edinburgh is identified within the LDP as a strategic development area and the Edinburgh International Partnership has been set up to implement proposals.

The impact on the transport network of these proposed developments has been assessed. A number of site specific key measures necessary to support them were set out in the LDP Second Proposed Action Programme. These measures emerged from the original 2010 WETA Study and currently include the tram, Edinburgh Gateway Station and new and widened roads and junction improvements. The Action Programme is updated annually to take account of any changing circumstances and to include further details, where available, on each action. It was last updated in May 2015. This Refresh Study provides the basis for a significant update of the Action Plan with a revised set of recommended measures.

The LDP states that all proposals will be required to make appropriate contributions to the new and improved infrastructure specified in the Action Programme. Policies Del 1 (Developer Contributions) and Del 2 (Retrospective Developer Contributions) and the associated Developer Contributions and Affordable Housing guidelines ("the Guidelines") set out the approach to developer contributions for infrastructure provision. The approach is linked closely to the Action Programme. It requires developer contributions from any development if:

i. It will have a net impact on infrastructure capacity; and

ii. It is necessary to mitigate that impact by providing additional capacity or otherwise improving existing infrastructure.

The policies state that, in line with national policy, developer contributions will only be required where they are necessary, proportionate and directly related to the impact(s) of a proposed development and they will reflect any changes to the Action Programme. Although not stated, avoidance of double counting is usually a principle in calculations.

11.2.2 Airport Permitted Development Rights

It is acknowledged that Edinburgh Airport maintains permitted development rights. The majority of development may proceed without attached planning conditions. Nevertheless, as a key destination and hub within Edinburgh and Scotland's transport network, the airport is an important partner in this refresh study. Many of the measures recommended within the package help facilitate network resilience and support future airport growth.

Throughout the refresh study the Airport has provided positive input into the refresh study and it will continue to have a very significant role in helping facilitate delivery of a number of key measures. It is also important to recognise that permitted development rights do not cover all infrastructure scenarios. In particular, any new link road is likely to require an environmental impact assessment and associated approvals, outside of existing rights. For these reasons it is important that the airport, CEC and other partners continue to work together to help deliver this and other key measures.

11.2.3 Possible Approaches

Approaches in other jurisdictions are not readily applicable due to differences in enabling legislation and regulations. For example planning legislation in England permits the use of standard charges and the Community

Infrastructure Levy (CIL) for highways and transport and charges can include maintenance payments. Nevertheless, CEC policies and the Guidelines offer potential approaches. Although they have not previously provided a mechanism for pro rata apportionment in relation to developments linked to the Action Programme, they do in respect of transport improvements linked to other developments and for tram.

Some developer contributions are linked to Contribution Zones. The area between Barnton and Maybury Junctions has been designated a Transport Contribution Zone. Maybury and Cammo, which are part of West Edinburgh, fall within it. Annex 1 to the Guidelines sets out the transport contribution for these developments based on number of housing units as a proportion of total units.

The level of contribution for tram required under Policy Del 2 depends on the following factors:

.i type of development,

.ii distance from tram route, and

.iii size of development.

The level of contribution is calculated using tables in the Guidelines. Table 2 in part 2C gives the amount in £'000s to be contributed towards the tram project by a development by using a scale factor (1-15), based on type of and size of development in terms of Gross External Floor Area, and the zone in which the development lies. There are guidelines and a map from which the zone can be determined. Where development proposals are in excess of Tables 1 and 2, these tables are applied on a pro rata basis to calculate the minimum level of contribution required.

Major developments defined as within scale factor 15 in Table 1 but on land outside the defined zone 3 are also considered in relation to their net impact on transport infrastructure, specifically in relation to trip generation on public transport. If the tram will help to meet or offset this impact, they may be required to make a contribution to tram.

11.2.4 Other Considerations

The CEC Guidelines set out a methodology for calculation of general transport requirements associated with developments outside Contribution Zones. It uses an indicative table of costs in February 2009 prices and applicability. Developers are expected to provide and meet, in full, the cost of all external works identified in a Transport Assessment and/or through the planning process. Developer contributions may also be required to enable satisfactory pedestrian, cycle and vehicle movement.

With regards to tram, any proposals for change of use also require to be calculated assess any potential contribution. This will be based on the proposed planning use(s) for the building(s)/land, minus the tram contribution based on the lawful planning use of the existing building(s)/land. Where, the resultant contribution is positive then this will determine be the contribution that is required to be paid for that development. Changes of use or subdivision falling below set thresholds will not normally result in an additional contribution.

11.3 The most appropriate contribution model for West Edinburgh

To help reach a conclusion on the most appropriate contribution model for West Edinburgh it is helpful to first of all set out a number of key principles. Some of these, as already referred to, come from national guidance and good practice whilst others relate specifically to West Edinburgh. These are set out below:

- Necessary - It is necessary to mitigate that impact by providing additional capacity or otherwise improving existing infrastructure;
- Proportionate – the level of contributions from different parties should reflect the respective impact of their activities/developments;
- Transparent – there must be clarity in how contributions are monitored and calculated and how they are directly linked to the scale of impact of expansions in activities/development
- Objectives driven – the mechanism should demonstrate how it addresses the specific objectives set for the package of interventions

Table 11.1 below sets out four key potential mechanisms for assessing contributions from the different partners in the West Edinburgh area against the key overall objectives set for the Refresh Study and the above key principles. Options for contribution apportionment include the following key criteria:

- Area (sq m, number of houses, beds, etc)
- Person trips all day
- Person trips peak
- Car trips all day
- Car trips peak

From table 11.1 it is clear that the contribution mechanisms that best support the overall objectives of the WETA Refresh are those that are directly linked to additional car based traffic. Sustainable development in West Edinburgh is to be encouraged and public transport and active travel should be consistently supported through the planning process.

Basing contributions on peak traffic impact performs most strongly against the objectives for example through more effectively targeting journey time reliability and not deterring development outside peak times when infrastructure has additional capacity. Land-use based approaches which are commonly used by other authorities, (based on parameters such as the area of commercial development or the number of housing units), whilst seeking to reflect additional demands on the transport network, do so indirectly and can tend to deter development of any sort which is not the aim of this appraisal refresh study. For example, it may well be appropriate that a land-use with very limited impact on peak hour traffic such as a leisure facility should pay a reduced contribution compared to a development with significant peak hour trip generation. Similarly it is vital in West Edinburgh, as set out in the LDP, that developers are encouraged to pay serious attention to detailed masterplanning considerations to encourage walking, cycling and public transport use. A land-use based approach e.g. linked to housing numbers would not pick this up and the same is also true of a person trips based approach whereas a peak hour traffic based approach helps incentivise sustainable planning and quality design.

Having considered the most appropriate contribution apportionment mechanism, the next stage is to decide on the most appropriate basis for calculating the impacts of different developments/traffic generators. There are three key approaches that could be adopted:

- a Transport Model based approach
- a Transport Assessment (TA) based approach, and
- an Incentivised approach

These three different approaches are tested against the Refresh objectives and the key principles in Table 11.2 overleaf.

Table 11.1 and 11.2 key

Strongly address objective or movement	
Address objective or movement	
Neutral	
Some conflict with objective	
Major conflict with objective	

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Table 11.1: Contribution mechanism, appraisal against objectives

Potential Contribution Mechanism	Overall Objective To support West Edinburgh Planning Framework growth	WETA Refresh Objectives						Necessary	Proportionate	Transparent
		Reduce variability of journey times & improve journey times for PT	To minimise and mitigate environmental impacts on local communities	To maximise mode share by walking, cycling and public transport	To improve accessibility to; through and within the area	To ensure resilience to handle foreseeable major events and incidents	To protect and enhance the natural and built environment of the area			
Based on developed area (sq m)										
Person trips all day										
Person trips peak										
Car trips peak										
Car trips all day										

Table 11.2: Initial assessment mechanism, appraisal against objectives

Potential Contribution Mechanism	Overall Objective To support West Edinburgh Planning Framework growth	WETA Refresh Objectives						Necessary	Proportionate	Transparent
		Reduce variability of journey times & improve journey times for PT	To minimise and mitigate environmental impacts on local communities	To maximise mode share by walking, cycling and public transport	To improve accessibility to; through and within the area	To ensure resilience to handle foreseeable major events and incidents	To protect and enhance the natural and built environment of the area			
Model based approach										
TA based approach										
Incentivised approach										

A range of different approaches have been adopted by the different transport consultancies preparing TA's for their respective clients and this variation could significantly impact on the level of contributions expected if a TA based approach was used. This variability is not unusual and to some degree reflects different balances of land-uses and approaches to masterplanning but it can also reflect different emphasis on car based travel, public transport and active travel modes. This has been a major source of concern within this study and was a key reason why a two scenario based approach was taken to the modelling with both a TA based and model based approach to mode share assumptions. A stand-alone Transport Assessment based approach risks individual analyses being undertaken using differing methodologies partly in an effort to minimise the development contribution. There is also the potential for a lack of transparency in the appraisal of each development leading to potential dispute and legal challenge.

A model based assessment using the CEC suite ensures a greater level of consistency of assessment. It also provides the ability to test alternative mode share options and cumulative impacts. Nevertheless, it is important to note that all models have limitations and that results would need to benchmarked and sense checked to ensure equitability. In short, a pragmatic approach to the assessment of the transport impacts of each development would still be required as a check against model outputs.

The method of contribution that emerges most strongly from the appraisal against the objectives and principles in the table is the incentivised approach. Strategic model outputs would be used as a basis to define initial contributions, however, these would be adjusted based on actual traffic volumes and mode shares achieved.

Actual traffic volumes would be monitored by automatic traffic counters with contributions adjusted on an annual basis as development proceeds. This innovative approach should encourage landowners and other traffic generators responsible for contributions to actively pursue mechanisms that promote greater use of active travel modes and public transport and deter car based trips, particularly at peak times. These measures could include proactive travel planning, including personalised travel planning and information initiatives but also parking controls building on the wider parking control measures set out within this Appraisal Refresh.

Conversely, it would be possible for developers to be penalised if, for matters within their control, the forecast model mode shares were not achieved.

11.3.1 Attribution of Infrastructure/Packages

Having concluded that a Peak Car trips based approach and an incentivised mode share approach (based on the model) potentially offer the best options for a developer contribution model for West Edinburgh, we now consider how different measures within the Refresh Appraisal should be attributed to developers and other trip generators and also the potential role of City Deal. There are a number of different approaches that could be taken to this which are explored below.

Site Specific Development Measures

There will always be specific measures that need to be delivered to enable individual development sites to move forward, often providing upgraded or even new accesses to the development site itself or in close vicinity. These measures should be identified within the specific Transport Assessment (TA) for the development that will still be required to address these site specific issues within the wider strategic context set by this Refresh Study.

As already highlighted, it would be expected that the full costs of these specific site access measures and other internal transport networks that do not have wider traffic or PT functions, would be funded through the specific developer/s. Given that these measures can be directly attributed to specific developments, this satisfies the key principles of Necessary, Proportionate and Transparent. These site specific measures for developments proposed within West Edinburgh will need to be agreed through the established TA process between CEC and the developers of each site.

Funding the Refresh Infrastructure Package

The package of transport infrastructure measures developed and costed within this Refresh study clearly play a much wider role in both minimising the negative impacts of traffic generated by development and airport growth and supporting the wider active travel, public transport and road networks in West Edinburgh. The key principles of Necessary and Proportionate as already stated highlight that developer and other growth related contributions should fairly cover the measures and costs associated with the projected growth but not rectify all existing issues.

There are again several relevant options which could be taken to determine how elements of the package could be attributed either on a collective or individual basis These are set out below:

All developers contribute to all of the Refresh Transport Infrastructure Package:

- This is simple and satisfies the principle of transparency
- The Peak Car trips mechanism would mean that this approach could be proportionate with those developments/trip generators responsible for producing the highest number of Peak Car based trips making the largest contributions to the packages
- This could be open to challenge as has occurred elsewhere in Scotland, with developers and other trip generators potentially arguing that their contributions to some of the measures are not necessary as their activities may not directly impact on the flows that the interventions seek to address. It may thus not satisfy the proportionality principle as well.

Selective Attribution of Measures/Package

- By specifically allocating or attributing measures to the impacts of an individual development/trip generator, it is possible to ensure that the key principles of Necessary and Proportionate are satisfied.
- This approach allows considerable freedom with the ability to include contributions from a wide range of different parties
- The key negative aspect of this approach is that it could be very complex with decisions needing to be made in relation to which individual infrastructure measures would need to be allocated to any individual developer/trip generator.

Combination Approach – with core package

- This approach sets out a fairly large core package of measures that it can be demonstrated are relevant to all developers. This might for example include all of the Active Travel Measures and the core A8/A89 traffic and bus priority related measures (potentially with other contributions where appropriate e.g. Kilpunt Park and Ride).
- Other measures are then attributed to specific developers/trip generators who, it can be demonstrated, impact on that element of the network. This could for example include elements of the new Link Road/ Main Street or Eastfield Road.
- This mechanism could help maximise the benefits of each approach with a fairly robust core package to which all developers contribute on the basis of their peak hour flows, but with other measures being allocated to specific developers/trip generators who impact on them. The current CEC Transport Model could be used to help assess the appropriate split between developers/trip generators but also the non-development induced growth which should be picked up by the public sector (including possibly City Deal). This should help address both the necessary and proportionate principles.

It is clear from this assessment that the combination mechanism offers the most advantages for West Edinburgh.

11.3.2 City Deal

It has already been identified that the recommended Infrastructure Package for West Edinburgh provides wider benefits and tackles existing network constraints across the range of transport modes as well as supporting growth in West Edinburgh and minimising any negative impacts derived from developers/trip generators. Particularly good examples of this are the improvements proposed for the Gogar/Maybury area. It is thus important, following the established principles of Necessary, Proportionate, Transparent and Objectives driven, that the funding mechanism adopted for West Edinburgh addresses this wider benefits issue ensuring that developers and other transport generators are not unfairly burdened. If this is not addressed it could leave the funding mechanism open for challenge and, through the very significant levels of funding required, result in the contributions not being affordable and thus preventing development and other growth from proceeding.

The West Edinburgh Transport Appraisal Refresh Study is feeding into a wider City Deal bid by the six local authorities in the Edinburgh and South East City Region. City Deal involves a bespoke partnership between the Scottish Government, the UK Government and local government, along with other regional partners to take forward and accelerate projects that can support a long-term focus on the priorities required to deliver Scotland's

Economic Strategy. If a successful City Deal for the Edinburgh and South East City Region is agreed, it could allow for significant public sector investment in infrastructure. This could potentially include financial support for an agreed West Edinburgh package of measures in combination with the contributions from developers and other parties. The input from City Deal could help ensure that any contributions to the recommended package of transport measures for West Edinburgh from developers and other parties such as Edinburgh Airport are at a level, that whilst still very significant, could be deemed as not being so excessive that they prevent development and wider growth taking place.

Work will be progressed following on from this Refresh Study to calculate the appropriate level of support that could be provided through City Deal to sit alongside developer and associated contributions (calculated using the approaches set out in this chapter) enabling the strategy to be taken forward for delivery. The CEC Strategic transport model used to inform this Refresh Study will help inform this exercise.

11.4 Recommendations

From the above analysis of development/trip generator contributions within the specific context of West Edinburgh, using an objectives and principles based approach, the following clear recommendations have emerged:

- A Peak Car trip based Approach – using the CEC model
- An Incentivised Approach to mode share (i.e. based on CEC model but with contributions reduced if they can be proven through monitoring to meet lower TA based targets)
- A Combination Approach to the attribution of the package – a core A8 and Active Travel package which all parties contribute to with specific attribution of other measures

It will be essential to develop appropriate mechanisms of agreement to incorporate this recommended approach with appropriate expert Legal advice to both support this strategy and avoid any potential challenge. A spreadsheet based tool has been developed to facilitate the calculation of appropriate contributions, based on model outputs, with the ability to test different scenarios relating to the attribution of measures.

12. Summary and Conclusions

12.1 Summary and conclusions

The West Edinburgh Transport Appraisal (WETA), published in February 2010, was developed as a strategic appraisal of possible transport interventions to support the implementation of the West Edinburgh Planning Framework.

The purpose of this study has been to refresh WETA in order to capture revised development and airport related growth projections and current and forecast transport and development interventions. The two key drivers of the refresh are City Deal and a number of live planning applications.

The study has sought to clarify how any potential City Deal funding could help unlock constraints to delivering the necessary infrastructure to support major development in West Edinburgh and the levels of airport growth anticipated. It also makes recommendations as to the preferred mechanisms for determining development contributions required to support the proposed area wide transport interventions.

The study has been objectives led throughout. The key aims are a refinement of earlier work and placing an increased emphasis on supporting growth within West Edinburgh while encouraging a continued shift to sustainable travel.

A mixed package of deterrent and incentivised measures has been developed. Walking, cycling and public transport measures account for 40% of the total package cost. Nevertheless, in order to achieve the mode share targets envisaged, a key focus has been on developing a comprehensive package of parking controls. These, combined with a strong monitoring and enforcement regime, will be essential in promoting sustainable travel by public transport and active modes.

A key focus has been on multi-modal travel and how to improve travel movements which are not currently well served by public transport. Generally, east / west connectivity to West Edinburgh is very good but links to north and south Edinburgh are poor. A number of interventions have been tested and appraised to address these movements including various bus priority measures.

A strong modelling basis has been applied in the development of the package of measures. Using the CEC Strategic model, mode share scenarios have been assessed using both demand model forecasts and Transport Assessment values. These have enabled road, junction and public transport capacities to be explored. Selected VISSIM microsimulation modelling has also been undertaken to test the emerging package of road measures in more detail. Specifically, road capacity between Gogar and Maybury junctions is an existing network constraint and microsimulation modelling has helped identify measures which can markedly improve network performance.

The West Edinburgh Planning Framework sets out a long term vision for the area and promotes collaborative working between the Council, Scottish Enterprise, Transport Scotland, Edinburgh Airport, RHASS and the IBG developers. The WETA Refresh study has sought to build upon this established co-operation through an innovative collaborative working approach with a unique governance structure.

This method of working has been similarly applied at a technical level, with ongoing consultation and input from stakeholders and their consultants throughout. As an example, the proposed high level alignment principles of the new Link Road/Main Street have emerged by working through the potentially competing requirements of the airport and developers. Public transport measures have also been developed in consultation with major operators and neighbouring local authorities as well as the key partners and their consultants, with a focus on improved bus priority and interchange opportunities between modes as well as north / south connectivity, as described above. Public transport interchange enhancements include a new park and ride facility at Kilpunt and bus and tram interchange improvements at the Ingliston Park and Ride site. A comprehensive package of segregated cycling measures addressing a range of different movements has also been developed in discussion with West Lothian Council.

The refresh study has built on other relevant studies including the A89/A8 Corridor – Public Transport Improvement Study, undertaken by AECOM and the West Edinburgh Transport Study undertaken by WSP | PB. From these a number of infrastructure proposals have previously been defined. These and their indicative costs have been revisited and incorporated, where appropriate, into the WETA Refresh.

Although new measures have been identified, the overall cost of the infrastructure package has been significantly reduced compared to the original WETA (2010) study. Previous schemes, including an entirely new Dumbbell

Junction on the A8 and bus priority on the motorway network (Hard Shoulder Running), have been excluded. Instead, the refreshed objectives have led to a focus on maximising the potential of the West Edinburgh local road network through extensive bus priority and PT interchange measures, cycling measures, new link roads and targeted capacity improvements. The latter includes widening of the A8, eastbound, between Gogar and Maybury, which is a major existing network constraint. Proposed phasing has been identified for all measures, with an emphasis on unlocking early growth while maximising sustainability.

The report serves a dual purpose, helping inform planning decisions and the development of a persuasive submission for a wider City Deal bid. It includes an innovative, objectives led approach to identifying trip generation contributions. It is recommended that contributions are based on peak road traffic impacts only. This approach helps target peak journey time reliability while not deterring development travel off peak when infrastructure has additional capacity. This meets the key principles set of Necessary, Proportionate, Transparent and Objectives Driven. It also helps promote sustainable development in West Edinburgh, encouraging public transport and active travel without financial penalty as does a unique incentivised approach to contributions which is also advocated. While these would be agreed at the planning stage, they would be adjusted as development proceeds based on the actual traffic volumes and mode shares achieved with a strong monitoring regime adopted. A spreadsheet based contributions model, linked to the transport model, has also been developed to calculate appropriate contributions.

The intention is that this final report of the Refresh Study will be adopted as supplementary guidance by CEC as well as informing City Deal proposals and providing a key strategy for taking forward transport infrastructure in West Edinburgh for the various partners involved.

13. Monitoring and Evaluation

13.1 Monitoring and Evaluation

Monitoring and evaluation are integral to the process of achieving the refreshed WETA Planning Objectives. Indicators have been developed against each Objective, and these are shown in the Table 13.1 below together with a potential approach to monitoring.

It will be essential to collect a comprehensive package of initial survey data so that contributions can be determined based on an agreed 'before' transport baseline. Comprehensive 'after' monitoring can then be undertaken in accordance with appropriate best practice, for example in line with the Scottish Trunk Road Infrastructure Project Evaluation (STRIPE) approach, as advocated by Transport Scotland.

Table 13.1: Monitoring framework

Transport Planning objective To support West Edinburgh Planning Framework growth through:	**Relevant targets**	**Indicators**	**Measurement**
At a local and strategic level, reduce the variability of journey times and improve overall journey times for public transport	Edinburgh LTS indicator of journey time variability - aim to reduce journey time variability on key corridors including the A8 based on 2016 baseline of journey time variability	At a local and strategic level, reduce the variability of journey times and improve overall journey times for public transport	ANPR data through the Edinburgh's Urban Traffic Management and Control System (UTC) – data shows journey times in minutes on routes across the city including the A8. Lothian buses may also be able to provide data from Bus Tracker / LB Fleet Management Tool.
To minimise and mitigate environmental impacts on local communities – local air quality; road noise; severance (physical/speed)	National Standards (PM10): - 50 μg/m 3 not to be exceeded more than 7 times a year (24 hour mean) by end 2010. - 18 μg/m 3 (annual mean) by end 2010. National Standards (CO2): - Scottish Government Climate Change (Scotland) Act sets a target of cutting emissions by 80% by 2050, and 42% reduction by 2020.	To minimise and mitigate environmental impacts on local communities – local air quality; road noise; severance (physical/speed)	Road noise – monitoring requirements to be determined based on potential impact. Generally marginal other than for existing A8 corridor. Current air quality monitoring regime adopted by City of Edinburgh Council. Global CO2 data at local authority level. Speed and volumes of traffic – extension of existing data gathering mechanisms on A8 through Edinburgh's UTC. New development traffic surveys by mandatory ATC equipment.
To maximise mode share by walking, cycling and public transport (minimum 50% mode share to non-airport development)	To achieve a minimum PT and active travel mode share target of 50%. (Minimum 50% mode share for non-airport development)	To maximise mode share by walking, cycling and public transport (minimum 50% mode share to non-airport development)	Continuous traffic monitoring using ATCs on new link roads and each development access. Contribution mechanism supporting reduced payments where mode share targets are exceeded. Annual travel surveys monitoring active travel and PT use.
To improve accessibility to; through and within the area	Increase over base, population resident within 30 min and 60 min PT travel times.	To improve accessibility to; through and within the area	Working age population, resident in SEStran area, within 30 minutes and 60 minutes public transport travel time from centres of employment (LTS indicator) – measured through TRACC and CEC transport models.
To ensure the transport system has the resilience to handle foreseeable major events and incidents	Congestion to be no worse than existing base for showground and airport.	To ensure the transport system has the resilience to handle foreseeable major events and incidents	Comprehensive before survey (demand, speed, queues) required to capture existing impact of key major events – e.g. Royal Highland Show. After surveys will enable future monitoring and help inform potential new traffic management measures. Data from Lothian Buses Fleet Management Tool may provide useful existing and future PT journey time data.

Transport Planning objective To support West Edinburgh Planning Framework growth through:	**Relevant targets**	**Indicators**	**Measurement**
To protect and enhance the natural and built environment of the West Edinburgh area as set out in relevant documents	Minimise impact on natural and built environment.	To protect and enhance the natural and built environment of the West Edinburgh area as set out in relevant documents	Ongoing monitoring through planning process against relevant policy and guidance e.g. West Edinburgh Landscape Masterplan, Edinburgh Street Design Guidance, Designing Streets Policy, landscape designations, etc.

Appendix A. Development TA References

Development TA references

Edinburgh Airport	Passenger forecasts provided by AECOM
Airport Hotel, Hampton	Edinburgh Airport Hotel, Transport Assessment, AECOM, January 2015
Airport Hotel, Moxy	Moxy Hotel, Edinburgh Airport, Transport Statement, Fairhurst, December 2015
Cammo	Environmental Statement
East of Milburn Tower	Technical Appendix 5 – Access, Traffic and Transport, SWECO, August 2015
Edinburgh Park Phase 2	Future development agreed with CEC Planning
Fairview Mill, Ingliston	Fairview Mill, Ingliston, Transport Assessment, Transport Planning, March 2016
IBG West	West Edinburgh Transport Study, WSP | Parsons Brinckerhoff, September 2015
IBG East	West Edinburgh Transport Study – Phase 2, Travel Demand Assessment, WSP | Parsons Brinckerhoff, May 2016
RBS	Additional parking outlined by Modus Transport Solutions, May 2016
RHASS	RHASS Input Data to WETA 2016 Study, ARUP, May 2016
Turnhouse Road	Proposed Light Industrial Development, Turnhouse Rad, Edinburgh, Waterman Boreham,July 2009
West Craigs	West Craigs Proposed Development Transport Statement, Transport Planning, August 2014

Appendix B. Mitigation Measures

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Eastfield Rd

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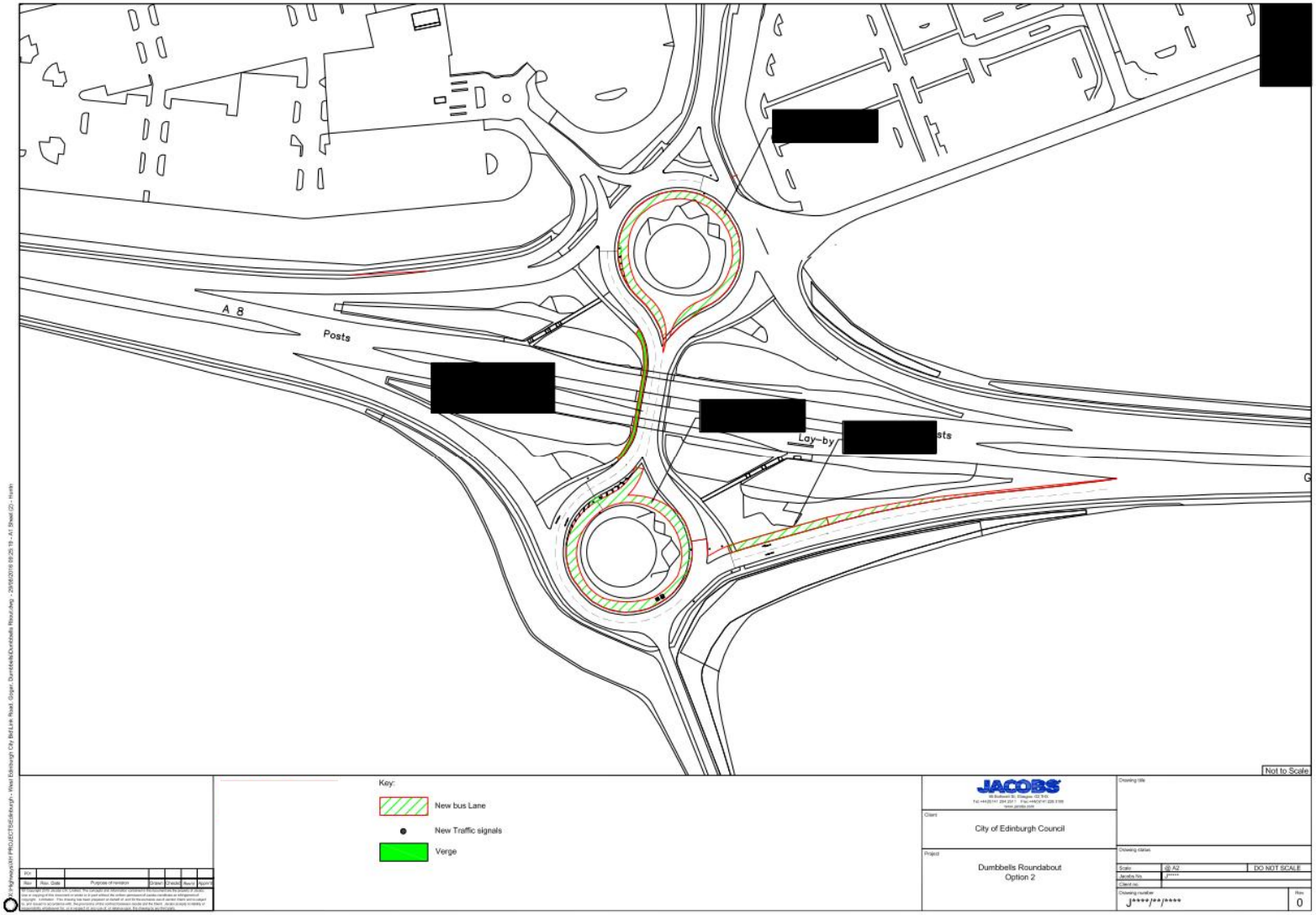
Dumbbell – additional northbound lane



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Link Rd – dualled section

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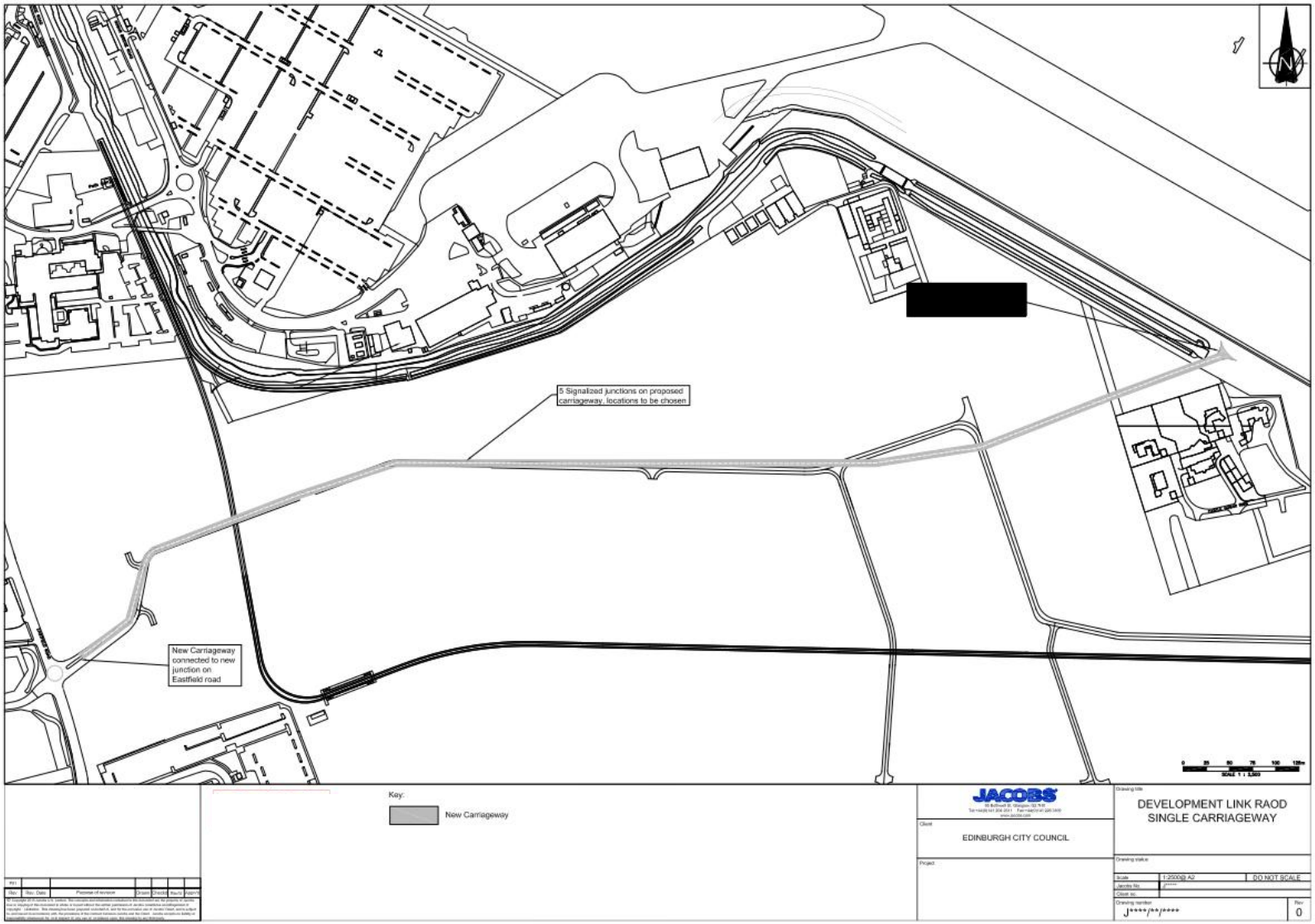
IBG 'Main Street'



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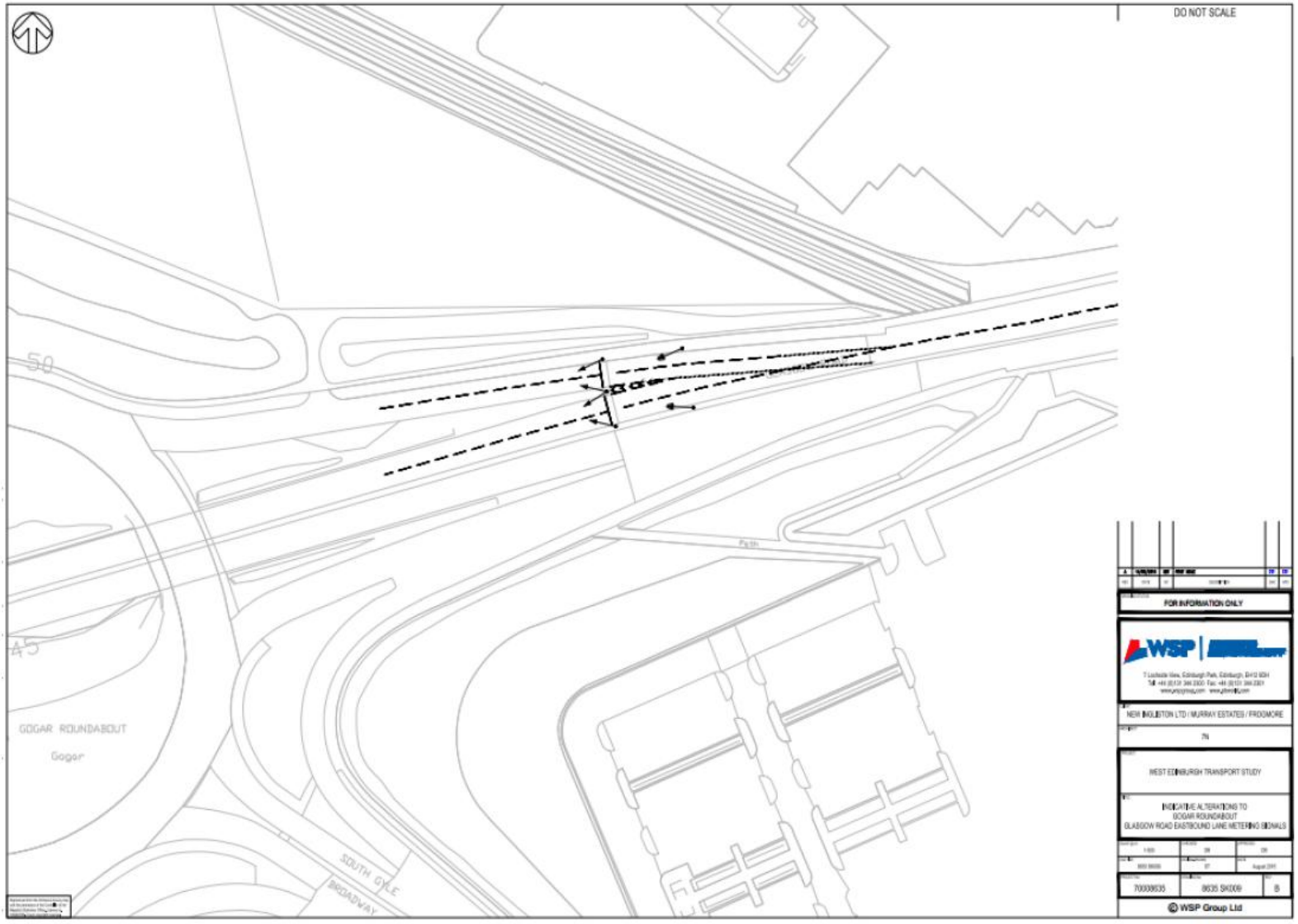
Gogar to Maybury ramp metering



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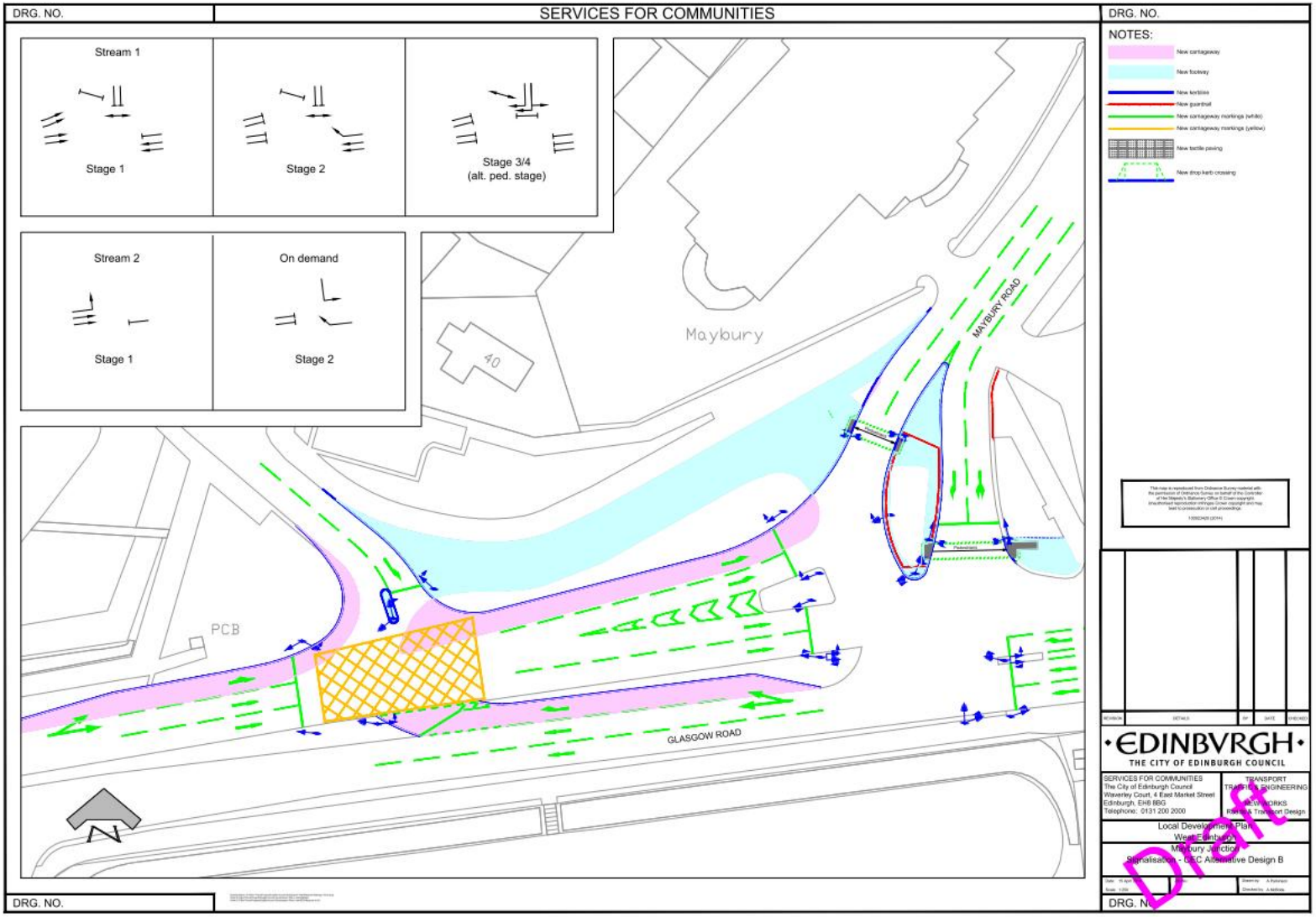
CEC proposal for Maybury



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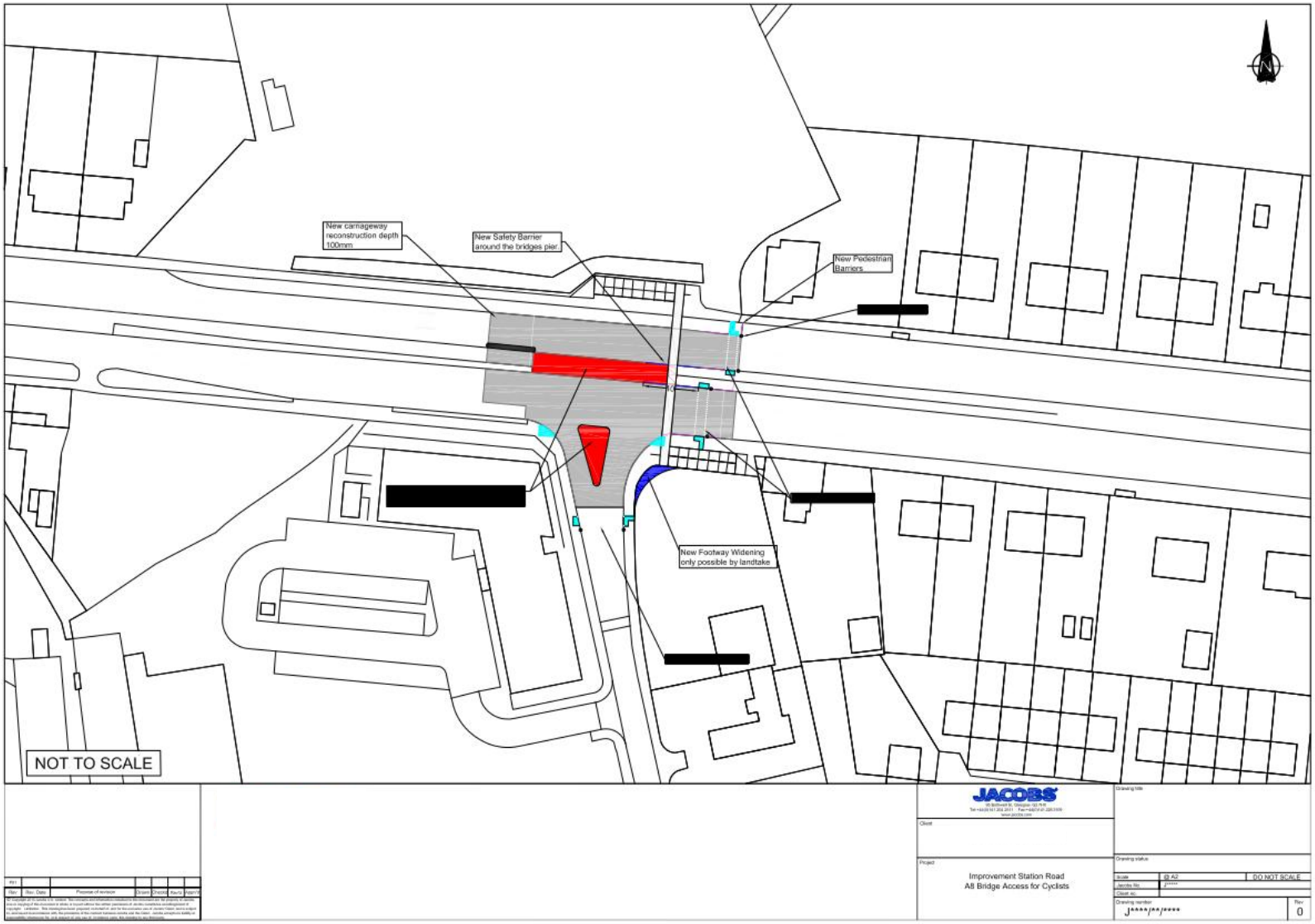
A8 / Station Rd



Appendix C. Alternative Mode Share Scenarios

Table C.1: Scenario A, 8 trams per hour, Airport – York Place trip generation and mode share

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	2288	2880	233	1103	1264	1089	0	804	508	381	128	56	147	1720	1064	50
HGV	7	7	3	4	3	4	0	0	62	61	0	0	2	14	10	13
LGV	12	11	2	3	2	4	0	0	29	43	0	0	15	121	9	5
PuT	1560	1972	122	982	628	858	895	0	6	88	35	66	14	493	378	0
PrT [Pers]	2654	3333	274	1277	1459	1262	0	924	689	558	147	64	188	2132	1246	78
PuT [Pass]	1560	1972	122	982	628	858	895	0	6	88	35	66	14	493	378	0
Prt+PuT{Pers]	4214	5306	396	2259	2087	2120	895	925	696	646	182	131	202	2625	1624	78
PT mode share %	37%	37%	31%	43%	30%	40%	100%	0%	1%	14%	19%	51%	7%	19%	23%	0%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	3534	2994	732	217	750	1292	804	0	188	440	66	87	1661	78	49	1057
HGV	22	23	2	2	2	2	0	0	34	20	0	0	16	1	10	12
LGV	54	41	2	2	2	2	0	0	22	37	0	0	133	12	5	4
PuT	2420	2051	490	43	384	204	0	895	66	80	62	4	261	20	1	128
PrT [Pers]	4152	3516	846	254	867	1490	925	0	280	572	75	100	2082	105	73	1234
PuT [Pass]	2420	2051	490	43	384	204	0	895	66	80	62	4	261	20	0	128
Prt+PuT{Pers]	6572	5567	1336	297	1251	1694	925	895	346	652	137	104	2343	126	73	1362
PT mode share %	37%	37%	37%	14%	31%	12%	0%	100%	19%	12%	45%	4%	11%	16%	0%	9%

Table C.2: Scenario A and B, 8 trams per hour, Airport – York Place private vehicle trips comparison

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	2308	2899	238	1110	1269	1097	0	804	599	485	128	56	163	1854	1084	68
Scenario B	2308	2899	319	835	578	778	0	804	151	319	266	259	163	1805	862	229
B – A	0	0	81	-275	-691	-319	0	0	-448	-166	138	203	0	-49	-222	161
% difference	0%	0%	34%	-25%	-54%	-29%	0%	0%	-75%	-34%	108%	363%	0%	-3%	-20%	238%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	3610	3058	736	221	754	1295	804	0	243	497	66	87	1810	91	64	1073
Scenario B	3609	3058	731	281	749	422	804	0	240	165	66	285	1765	92	64	910
B – A	-1	0	-5	60	-5	-874	0	0	-4	-332	0	198	-45	0	0	-163
% difference	0%	0%	-1%	27%	-1%	-67%	0%	0%	-2%	-67%	1%	229%	-2%	0%	0%	-15%

Table C.3: Scenario A, 8 trams per hour, Airport - Newhaven trip generation and mode share (as Table 7.5)

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	2288	2880	234	1102	1271	1089	0	804	508	380	128	56	147	1714	1099	50
HGV	7	7	3	4	3	4	0	0	62	61	0	0	2	14	10	13
LGV	12	11	2	3	2	4	0	0	29	43	0	0	15	121	9	5
PuT	1560	1972	124	999	628	875	895	0	6	88	35	66	14	501	330	0
PrT [Pers]	2654	3333	275	1276	1467	1262	0	924	689	557	147	64	188	2125	1286	78
PuT [Pass]	1560	1972	124	999	628	875	895	0	6	88	35	66	14	501	330	0
Prt+PuT{Pers]	4214	5306	399	2275	2095	2136	895	925	696	645	182	131	202	2627	1616	78
PT mode share %	37%	37%	31%	44%	30%	41%	100%	0%	1%	14%	19%	51%	7%	19%	20%	0%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	3534	2994	727	216	745	1292	804	0	188	440	66	87	1655	78	49	1055
HGV	22	23	2	2	2	2	0	0	34	20	0	0	16	1	10	12
LGV	54	41	2	2	2	2	0	0	22	37	0	0	133	12	5	4
PuT	2420	2051	502	45	396	210	0	895	68	84	62	4	269	20	1	129
PrT [Pers]	4152	3516	840	252	861	1490	925	0	280	572	75	100	2075	105	73	1232
PuT [Pass]	2420	2051	502	45	396	210	0	895	68	84	62	4	269	20	0	129
Prt+PuT{Pers]	6572	5567	1343	297	1258	1700	925	895	347	655	137	104	2344	126	73	1361
PT mode share %	37%	37%	37%	15%	32%	12%	0%	100%	19%	13%	45%	4%	11%	16%	0%	10%

Table C.4: Scenario A and B, 8 trams per hour, Airport - Newhaven private vehicle trips comparison (as Table 7.6)

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	2308	2899	239	1109	1276	1097	0	804	599	484	128	56	163	1848	1119	68
Scenario B	2308	2899	319	835	578	778	0	804	151	319	266	259	163	1805	862	229
B – A	0	0	80	-274	-698	-319	0	0	-448	-165	138	203	0	-43	-257	161
% difference	0%	0%	33%	-25%	-55%	-29%	0%	0%	-75%	-34%	108%	363%	0%	-2%	-23%	238%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	3610	3058	731	220	749	1295	804	0	243	497	66	87	1804	91	64	1071
Scenario B	3609	3058	731	281	749	422	804	0	240	165	66	285	1765	92	64	910
B – A	-1	0	0	61	0	-874	0	0	-4	-332	0	198	-39	0	0	-161
% difference	0%	0%	0%	28%	0%	-67%	0%	0%	-2%	-67%	1%	229%	-2%	0%	0%	-15%

Table C.5: Scenario A, 8 trams per hour, Airport - Newhaven + IBG parking restraint trip generation and mode share

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	2288	2880	201	737	1128	648	0	804	508	374	125	54	145	1714	1076	45
HGV	7	7	3	4	3	4	0	0	62	61	0	0	2	14	10	13
LGV	12	11	2	3	2	4	0	0	29	43	0	0	15	121	9	5
PuT	1560	1972	116	1441	543	1221	895	0	6	88	35	66	14	504	343	0
PrT [Pers]	2654	3333	237	856	1303	754	0	924	689	550	144	62	186	2125	1260	72
PuT [Pass]	1560	1972	116	1441	543	1221	895	0	6	88	35	66	14	504	343	0
Prt+PuT{Pers]	4214	5306	353	2297	1846	1975	895	925	696	638	178	129	200	2629	1603	72
PT mode share %	37%	37%	33%	**63%**	29%	**62%**	100%	0%	1%	14%	19%	52%	7%	19%	21%	0%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	3534	2994	449	183	397	1090	804	0	189	439	67	84	1658	77	49	1062
HGV	22	23	2	2	2	2	0	0	34	20	0	0	16	1	10	12
LGV	54	41	2	2	2	2	0	0	22	37	0	0	133	12	5	4
PuT	2420	2051	953	43	750	203	0	895	68	84	62	4	263	21	1	130
PrT [Pers]	4152	3516	521	215	461	1258	925	0	281	571	77	97	2078	104	73	1240
PuT [Pass]	2420	2051	953	43	750	203	0	895	68	84	62	4	263	21	0	130
Prt+PuT{Pers]	6572	5567	1474	258	1211	1461	925	895	349	654	139	101	2341	125	73	1370
PT mode share %	37%	37%	**65%**	17%	**62%**	14%	0%	100%	19%	13%	45%	4%	11%	17%	0%	9%

Parking restraint (approximate £10 charge) applied to IBG1 and IBG2 AM destination and PM origin trips

Resulting mode share highlighted in **bold**

Table C.6: Scenario A and B, 8 trams per hour, Airport - Newhaven + IBG parking restraint private vehicle trips comparison

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	2308	2899	206	744	1133	656	0	804	599	478	125	54	162	1848	1096	63
Scenario B	2308	2899	319	835	578	778	0	804	151	319	266	259	163	1805	862	229
B – A	0	0	113	91	-555	122	0	0	-448	-159	141	205	2	-43	-234	166
% difference	0%	0%	55%	12%	-49%	19%	0%	0%	-75%	-33%	113%	380%	1%	-2%	-21%	265%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	3610	3058	453	187	401	1094	804	0	245	496	67	84	1807	90	64	1078
Scenario B	3609	3058	731	281	749	422	804	0	240	165	66	285	1765	92	64	910
B – A	-1	0	278	94	348	-672	0	0	-5	-331	-1	201	-42	1	0	-168
% difference	0%	0%	61%	50%	87%	-61%	0%	0%	-2%	-67%	-1%	239%	-2%	1%	0%	-16%

Table C.7: Scenario A, 16 trams per hour, Airport - Newhaven + bus enhancement trip generation and mode share

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	2288	2880	233	1012	1253	1012	0	804	508	374	128	54	146	1709	1098	45
HGV	7	7	3	4	3	4	0	0	62	61	0	0	2	14	10	13
LGV	12	11	2	3	2	4	0	0	29	43	0	0	15	121	9	5
PuT	1560	1972	126	1016	649	890	895	0	7	89	38	38	14	510	335	0
PrT [Pers]	2654	3333	274	1172	1446	1173	0	924	689	550	147	62	187	2120	1285	72
PuT [Pass]	1560	1972	126	1016	649	890	895	0	7	89	38	38	14	510	335	0
Prt+PuT{Pers]	4214	5306	400	2188	2095	2063	895	925	696	639	185	100	201	2630	1620	72
PT mode share %	37%	37%	32%	46%	31%	43%	100%	0%	1%	14%	21%	38%	7%	19%	21%	0%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Car	3534	2994	728	216	746	1289	804	0	188	440	66	87	1655	78	49	1059
HGV	22	23	2	2	2	2	0	0	34	20	0	0	16	1	10	12
LGV	54	41	2	2	2	2	0	0	22	37	0	0	133	12	5	4
PuT	2420	2051	508	45	405	215	0	895	68	84	62	4	269	20	3	125
PrT [Pers]	4152	3516	842	252	863	1486	925	0	280	572	75	100	2075	105	73	1236
PuT [Pass]	2420	2051	508	45	405	215	0	895	68	84	62	4	269	20	0	125
Prt+PuT{Pers]	6572	5567	1350	297	1268	1701	925	895	347	655	137	104	2344	126	73	1361
PT mode share %	37%	37%	38%	15%	32%	13%	0%	100%	19%	13%	45%	4%	11%	16%	0%	9%

Table C.8: Scenario A and B, 16 trams per hour, Airport - Newhaven + bus enhancement private vehicle trips comparison

AM 07:00-09:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	2308	2899	238	1019	1258	1020	0	804	599	478	128	54	163	1843	1118	63
Scenario B	2308	2899	319	835	578	778	0	804	151	319	266	259	163	1805	862	229
B – A	0	0	81	-184	-680	-242	0	0	-448	-159	138	205	1	-38	-256	166
% difference	0%	0%	34%	-18%	-54%	-24%	0%	0%	-75%	-33%	108%	380%	1%	-2%	-23%	265%

PM 16:00-18:00	Airport total		2301 IBG 1		2302 IBG 2		231 Park & Ride		2401 RHS		2402 Fairview / Hotels		229 RBS		2261 E of Millburn Tower	
	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
Scenario A	3610	3058	732	220	750	1293	804	0	243	497	66	87	1804	91	64	1075
Scenario B	3609	3058	731	281	749	422	804	0	240	165	66	285	1765	92	64	910
B – A	-1	0	-1	61	-1	-871	0	0	-4	-332	0	198	-39	0	0	-165
% difference	0%	0%	0%	28%	0%	-67%	0%	0%	-2%	-67%	1%	229%	-2%	0%	0%	-15%

Appendix D. Select Link Analysis

Figure A.1: Zone 2431 Airport AM origin select link

Figure A.2: Zone 2431 Airport AM destination select link

Figure A.3: Zone 2431 Airport PM origin select link

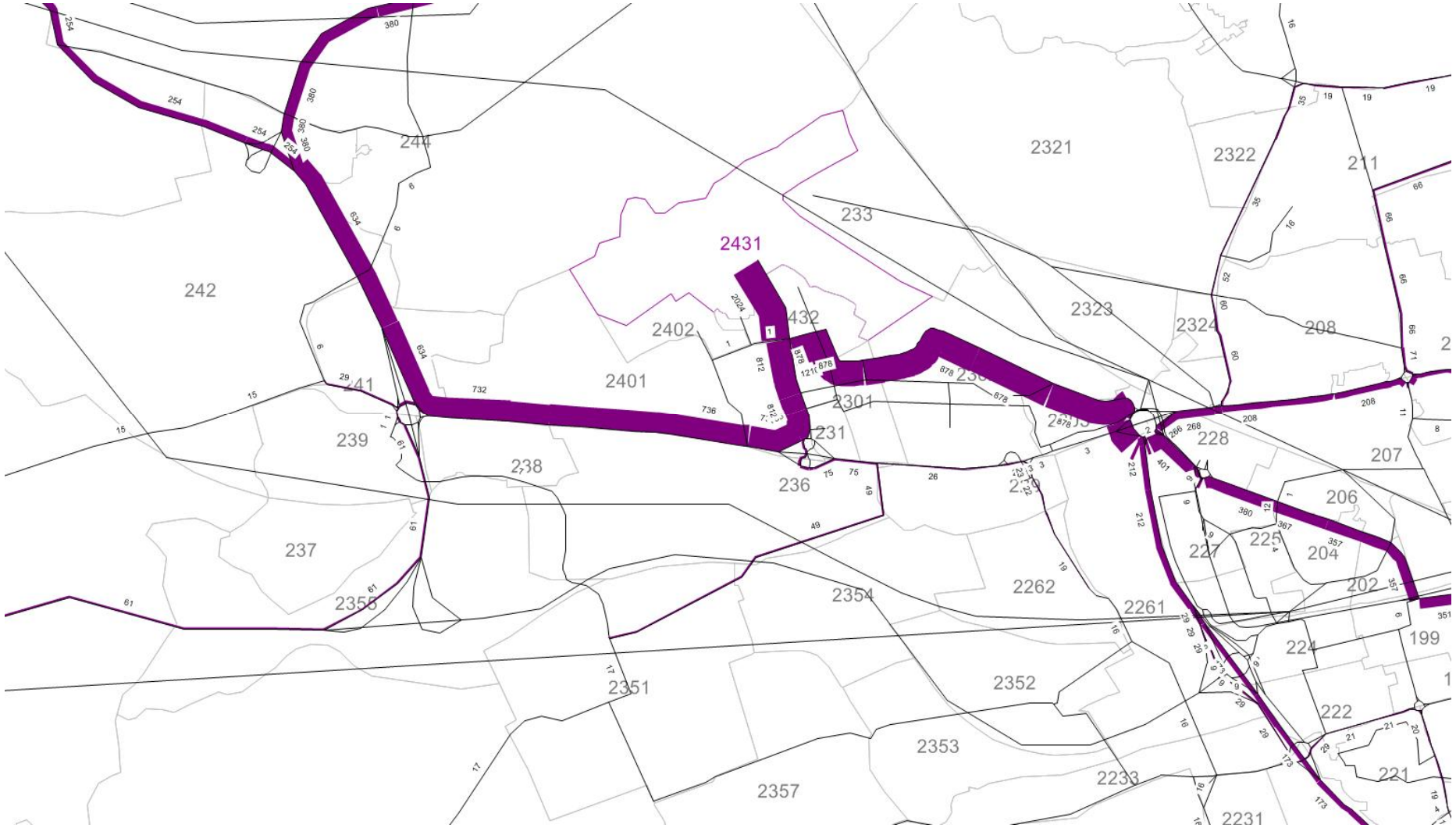


Figure A.4: Zone 2431 Airport PM destination select link

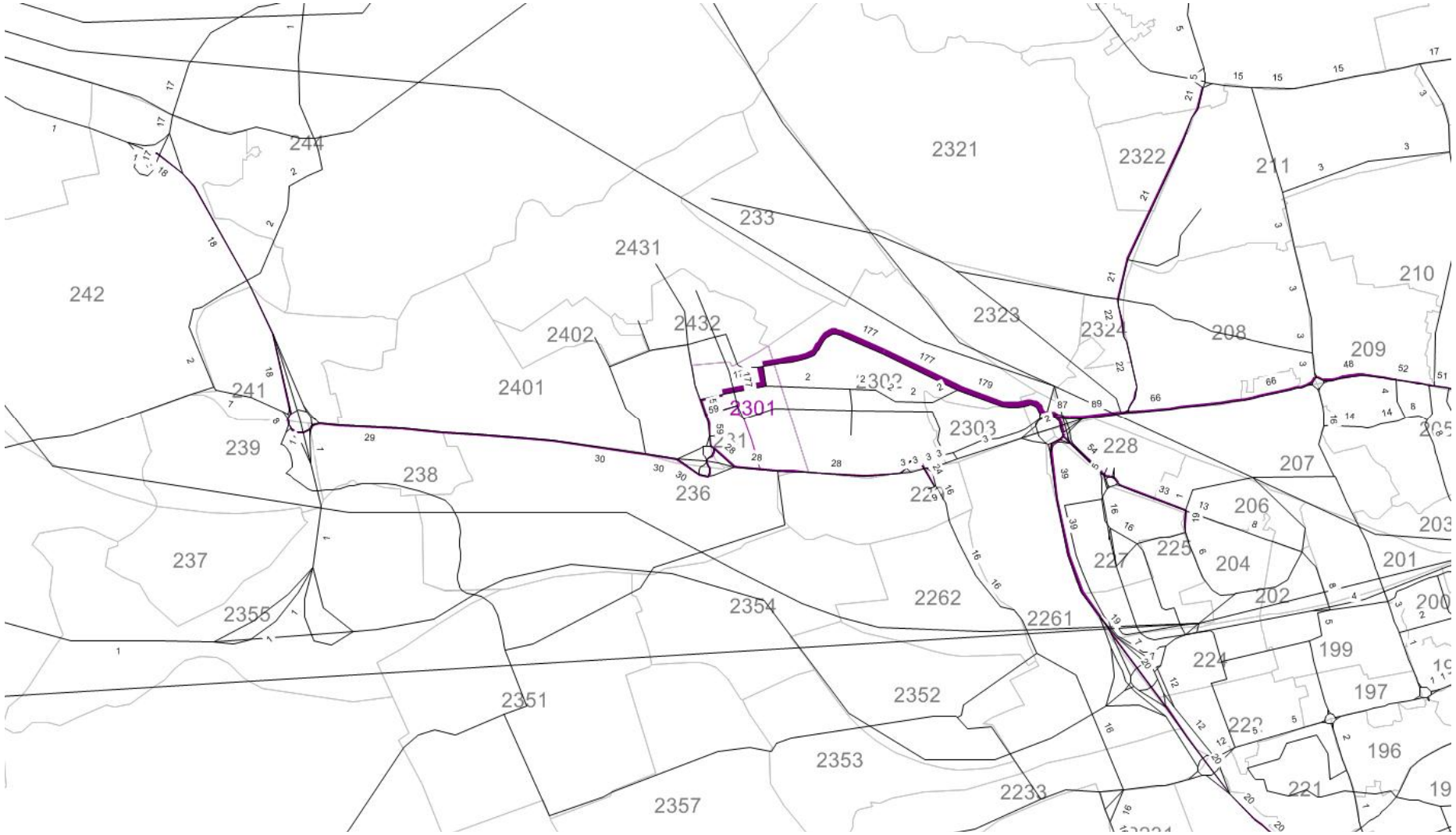


Figure A.5: Zone 2301 IBG1 AM origin select link

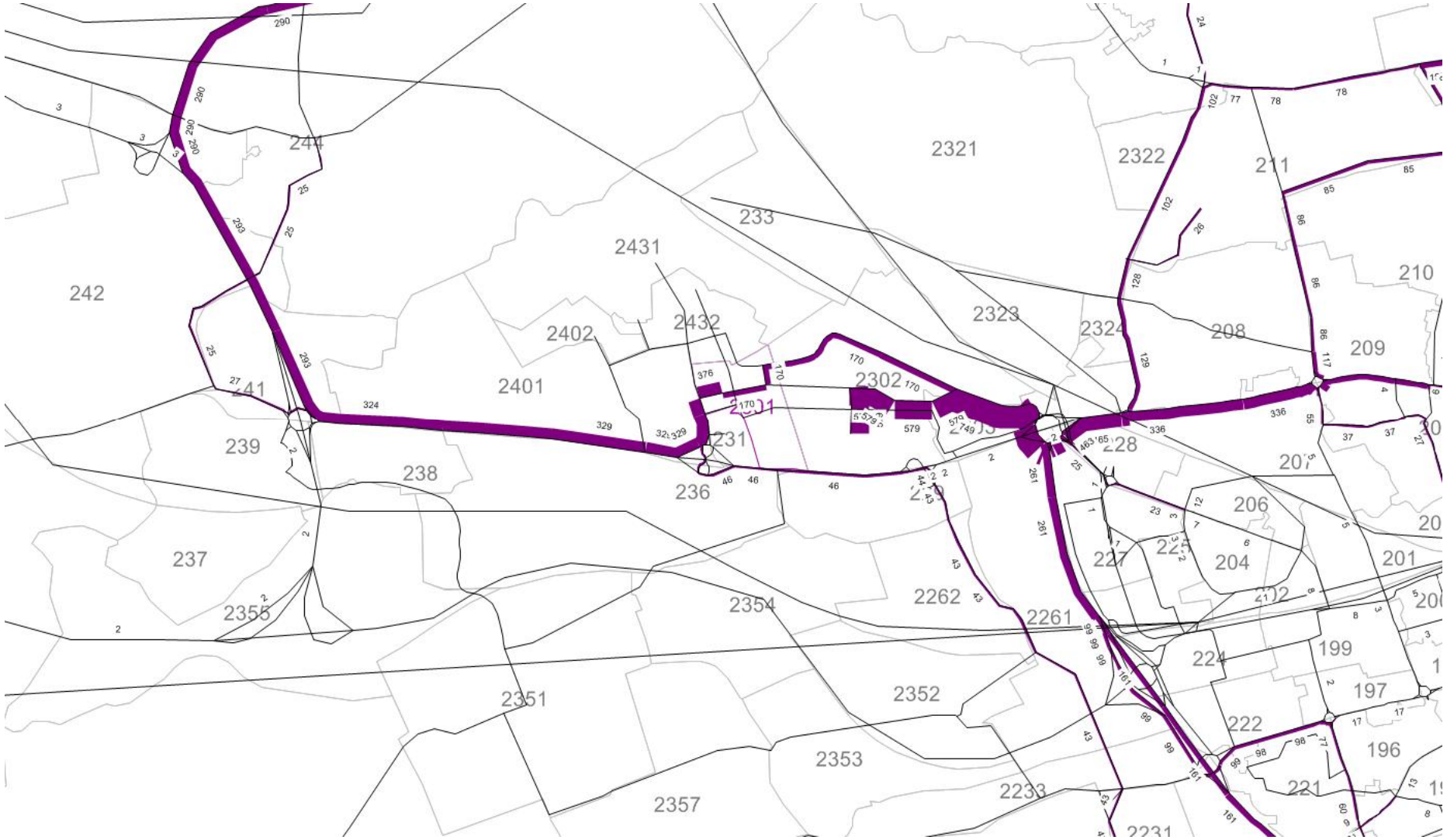


Figure A.6: Zone 2301 IBG1 AM destination select link

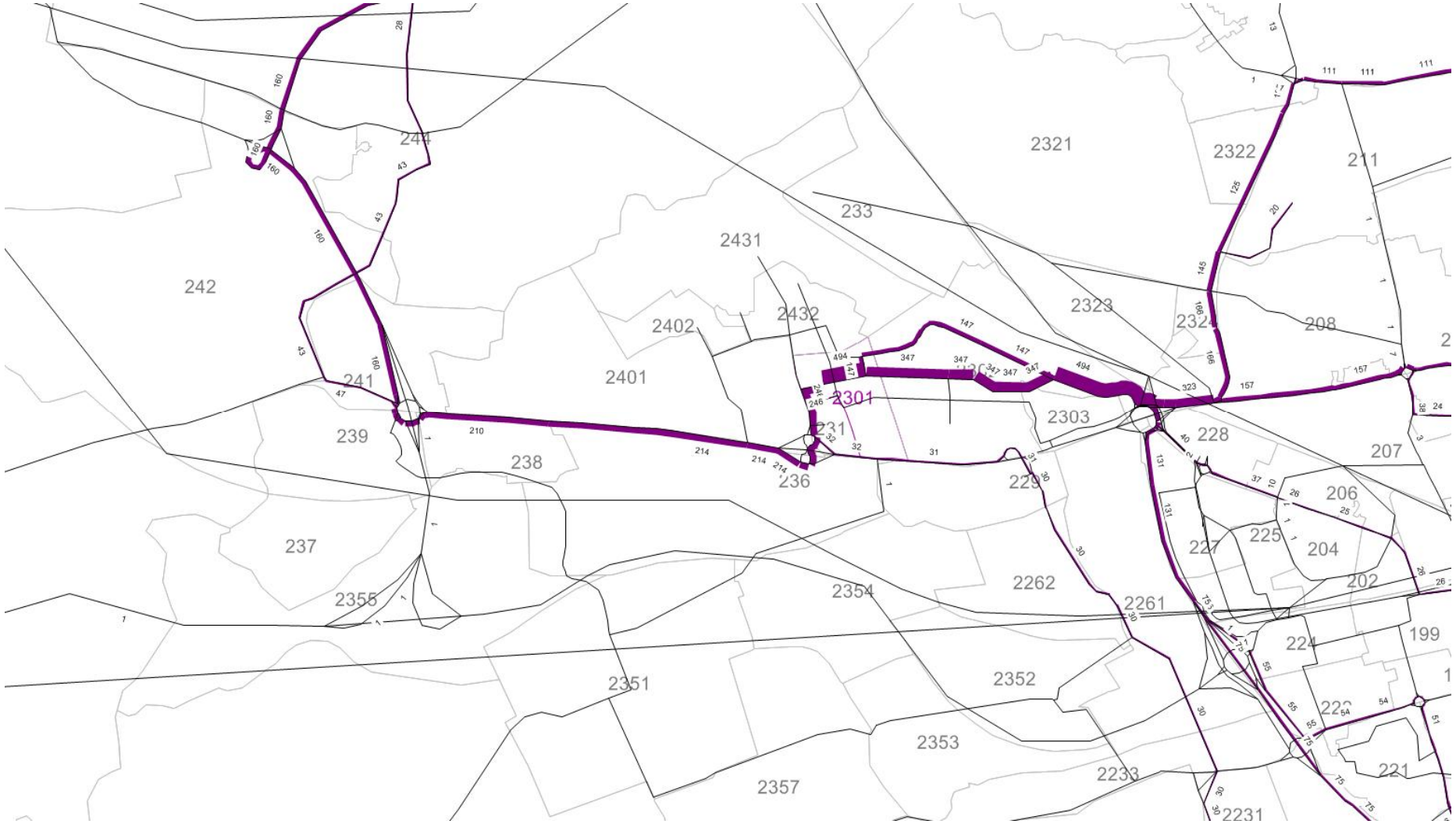


Figure A.7: Zone 2301 IBG1 PM origin select link

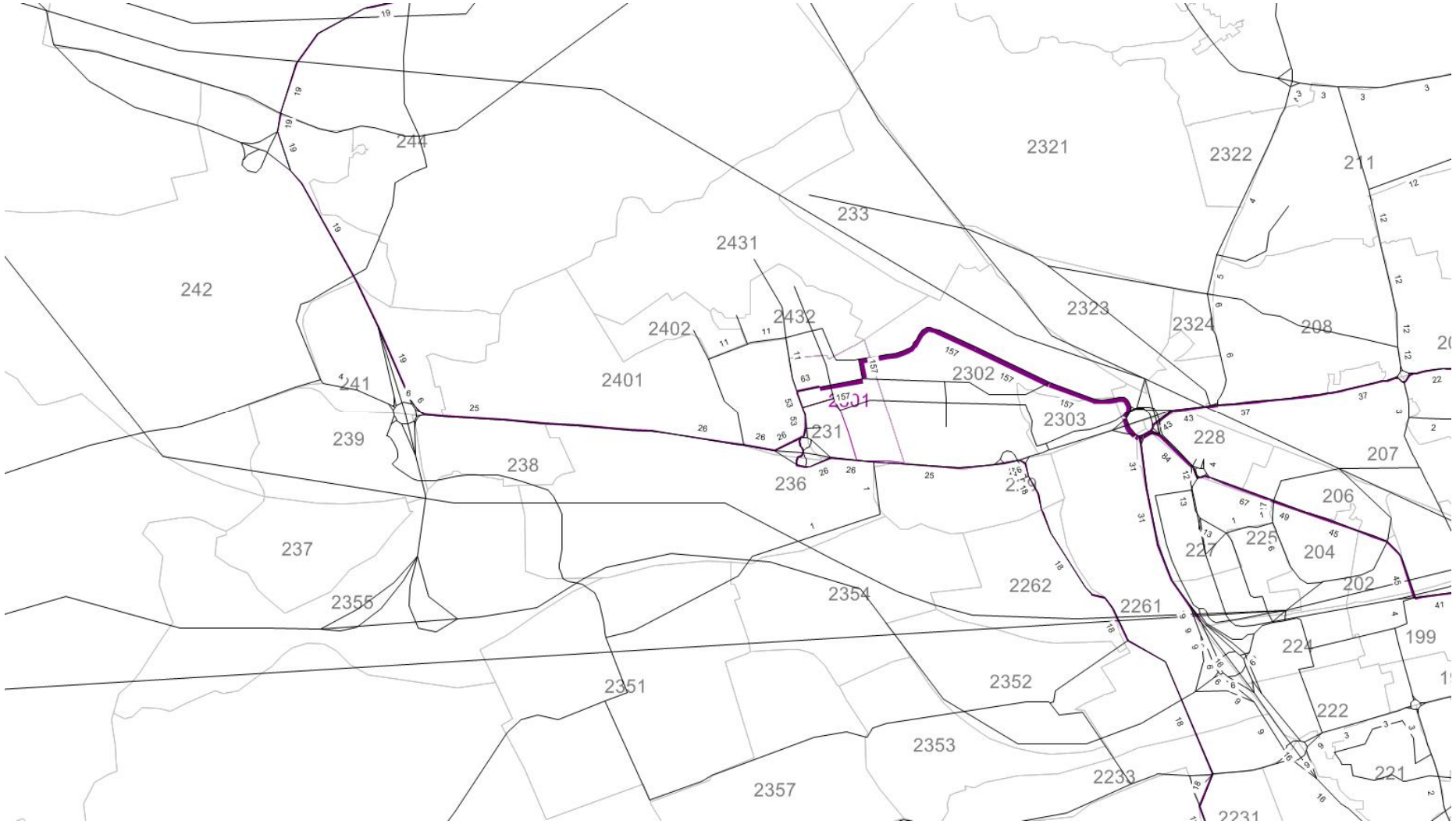


Figure A.8: Zone 2301 IBG1 PM destination select link

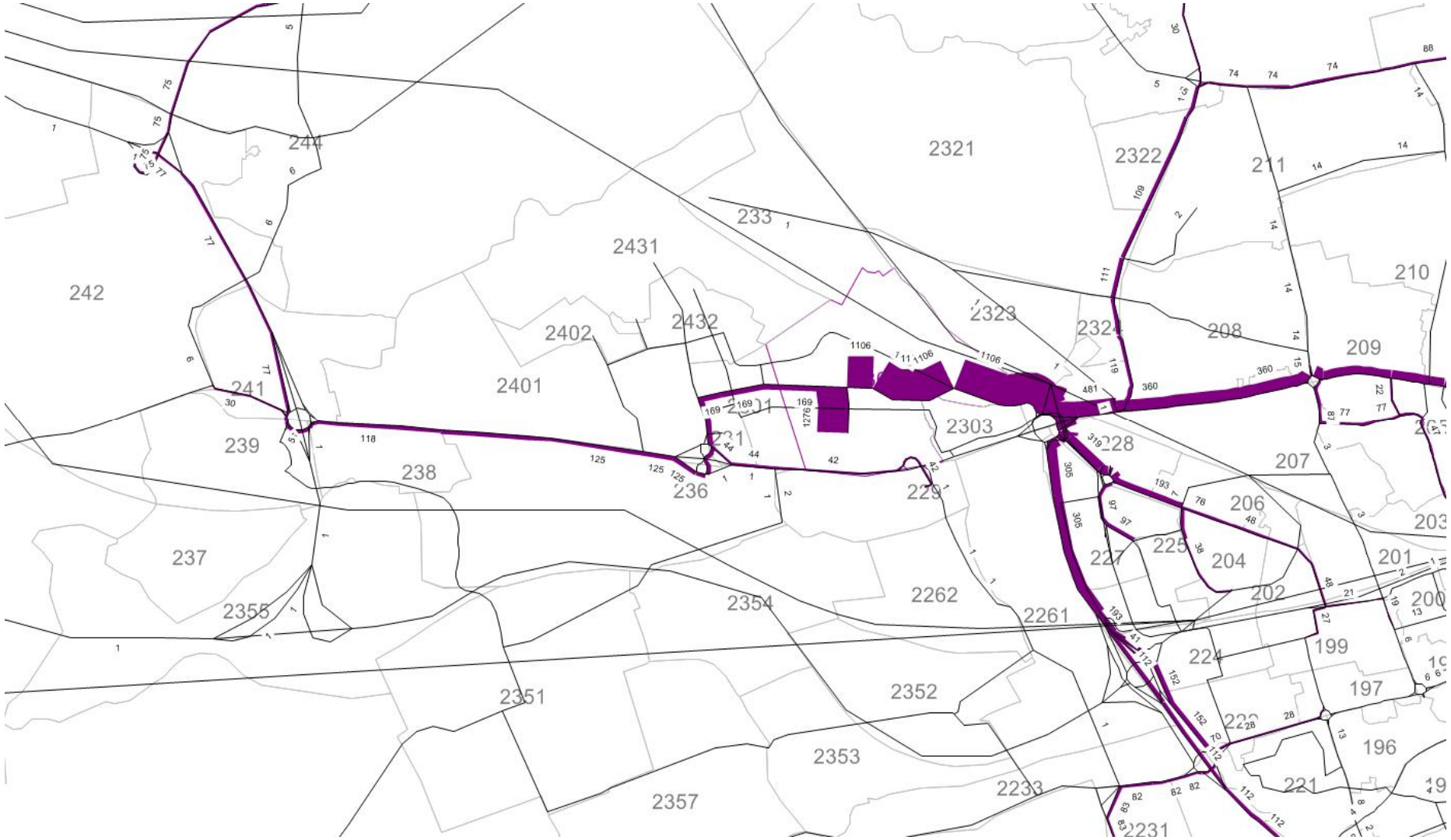


Figure A.9: Zone 2302 IBG2 AM origin select link

Figure A.10: Zone 2302 IBG2 AM destination select link

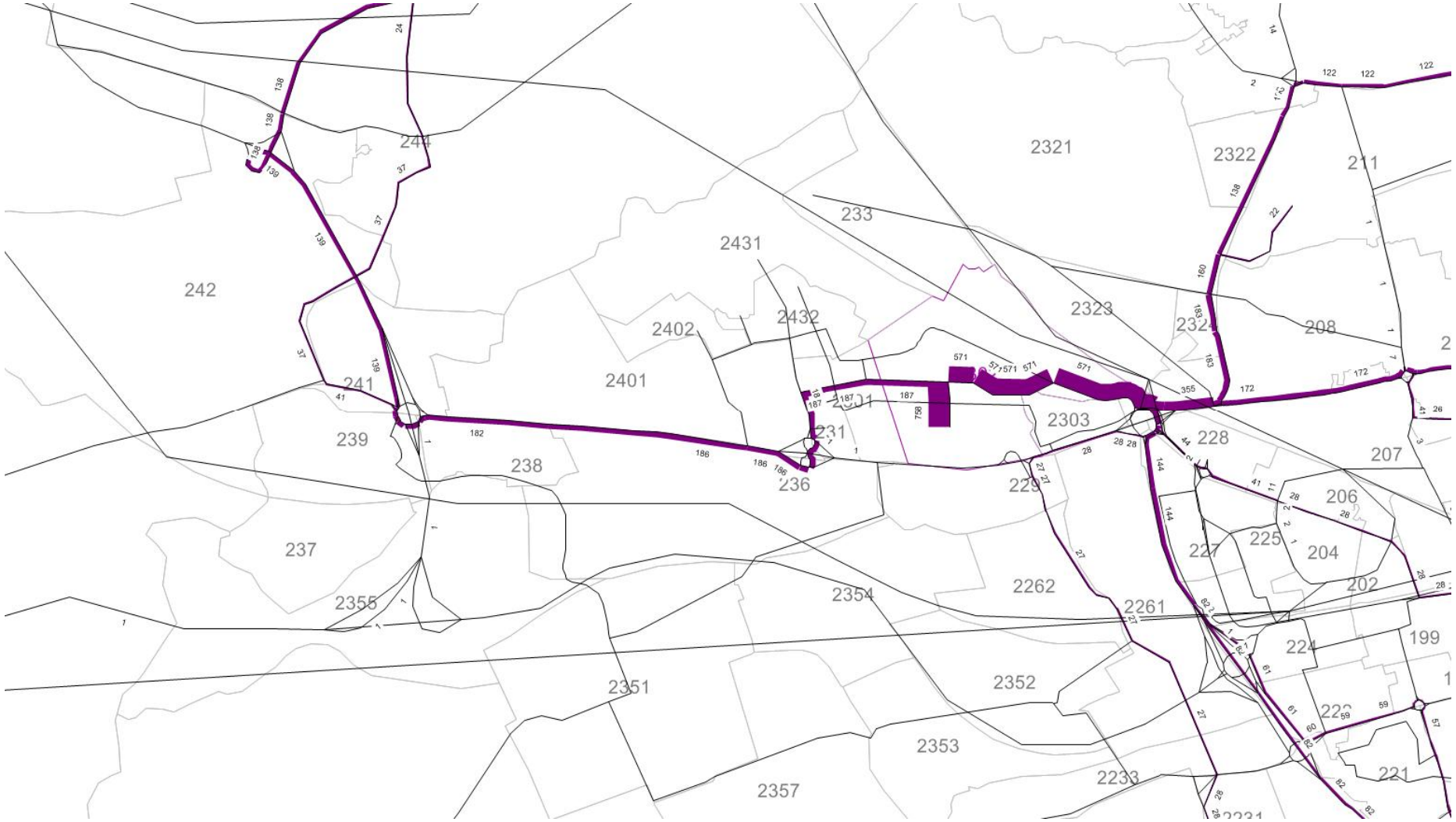


Figure A.11: Zone 2302 IBG2 PM origin select link

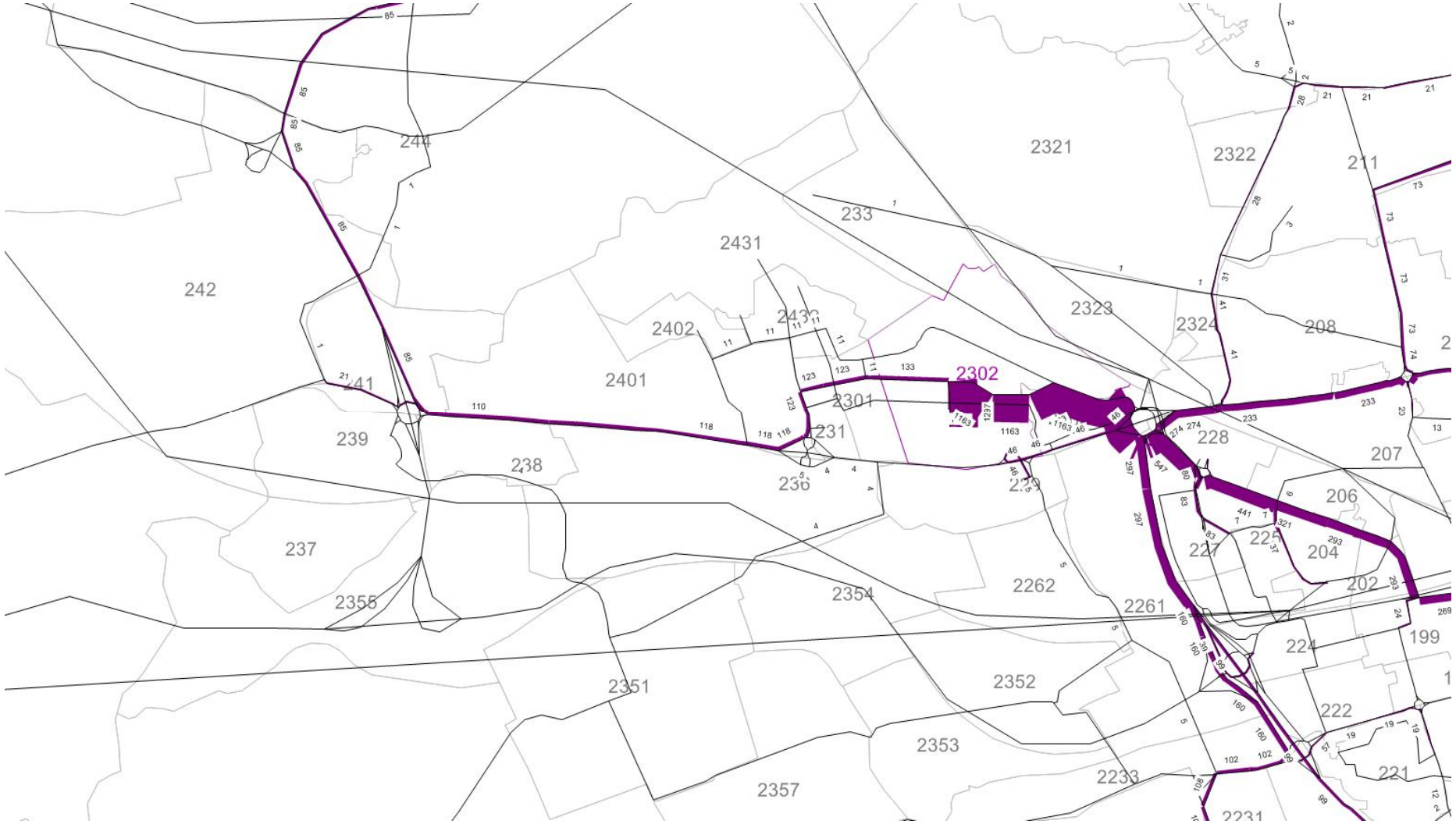


Figure A.12: Zone 2302 IBG2 PM destination select link

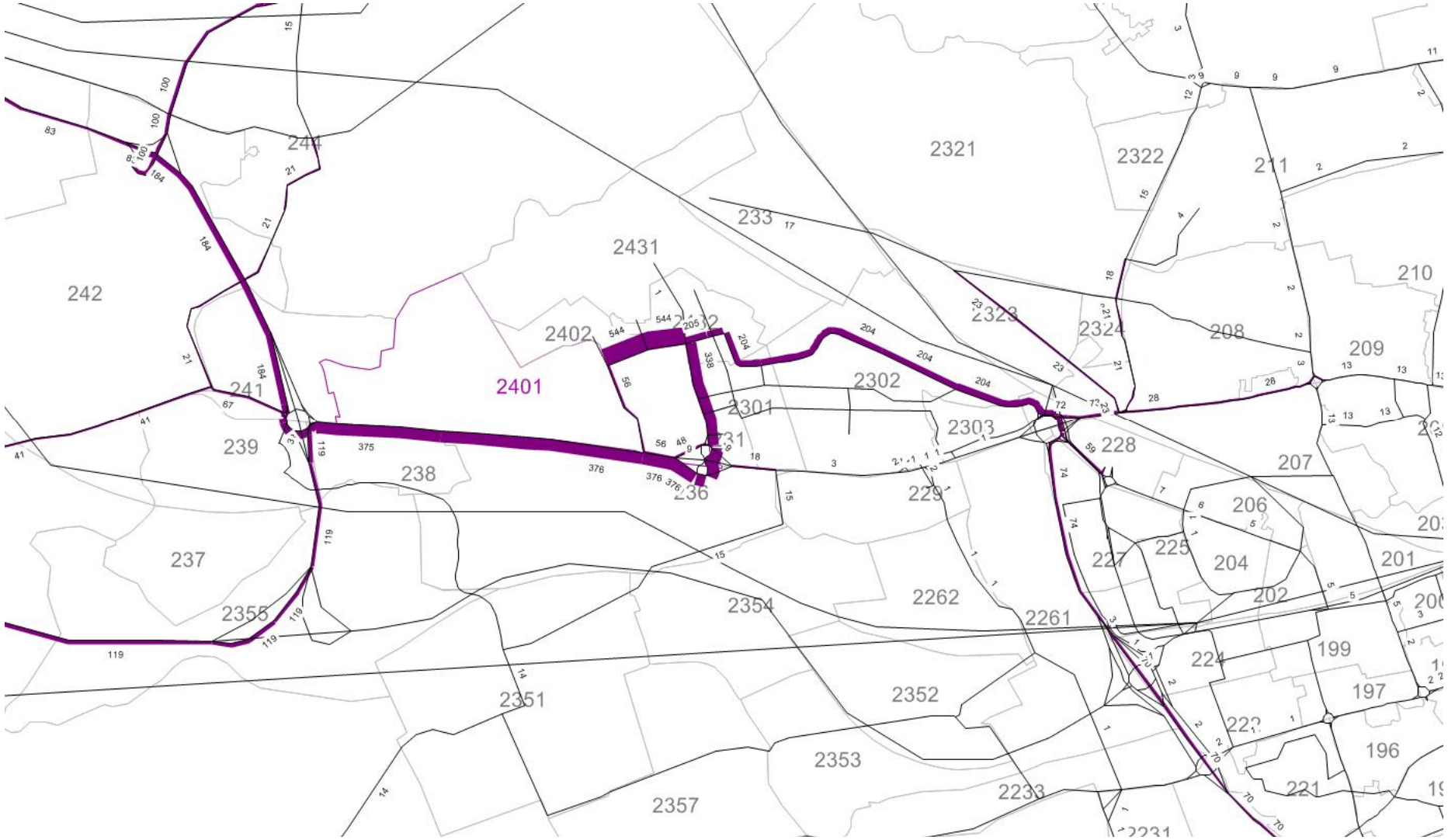


Figure A.13: Zone 2401 RHASS AM origin select link

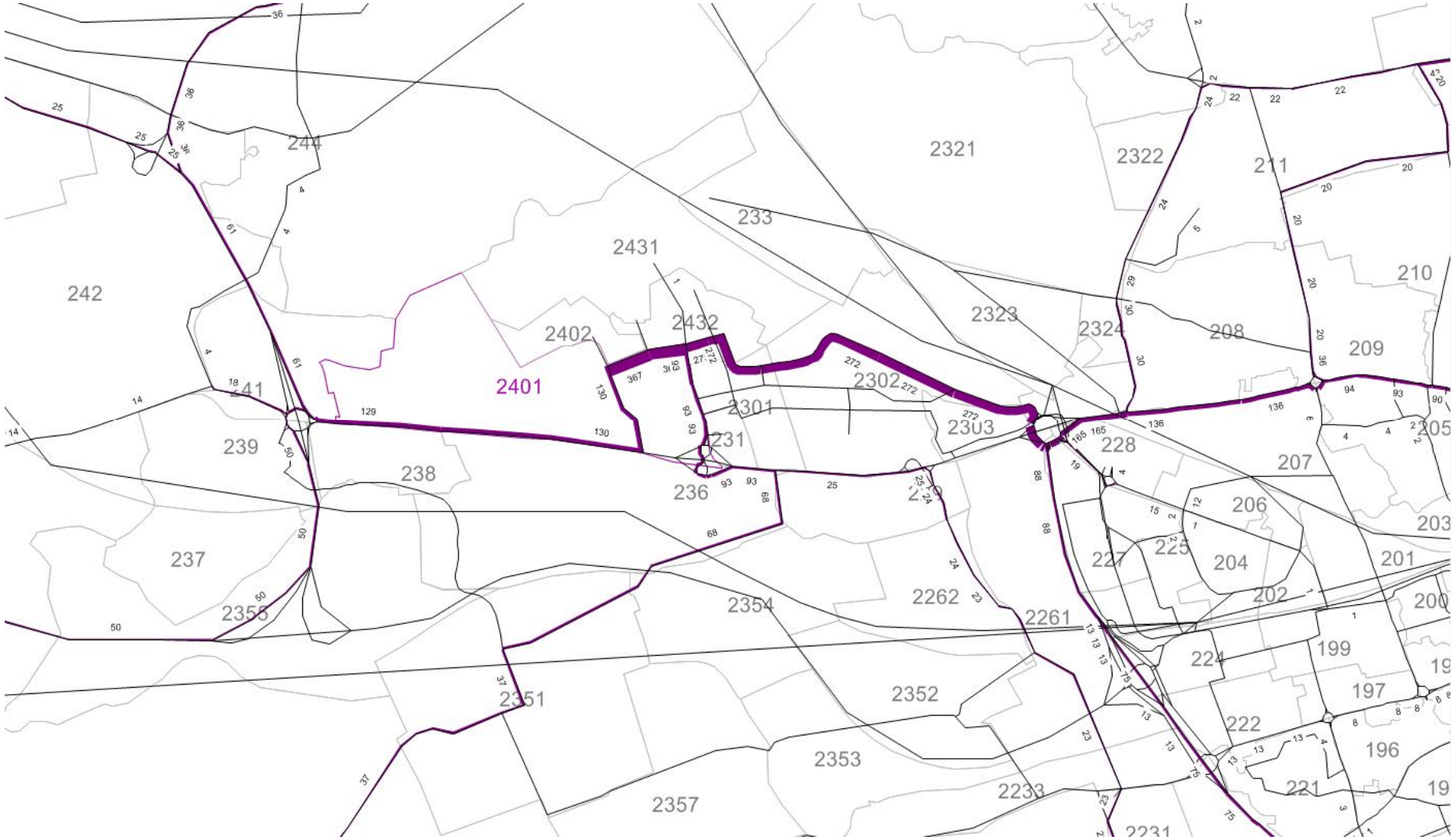


Figure A.14: Zone 2401 RHASS AM destination select link

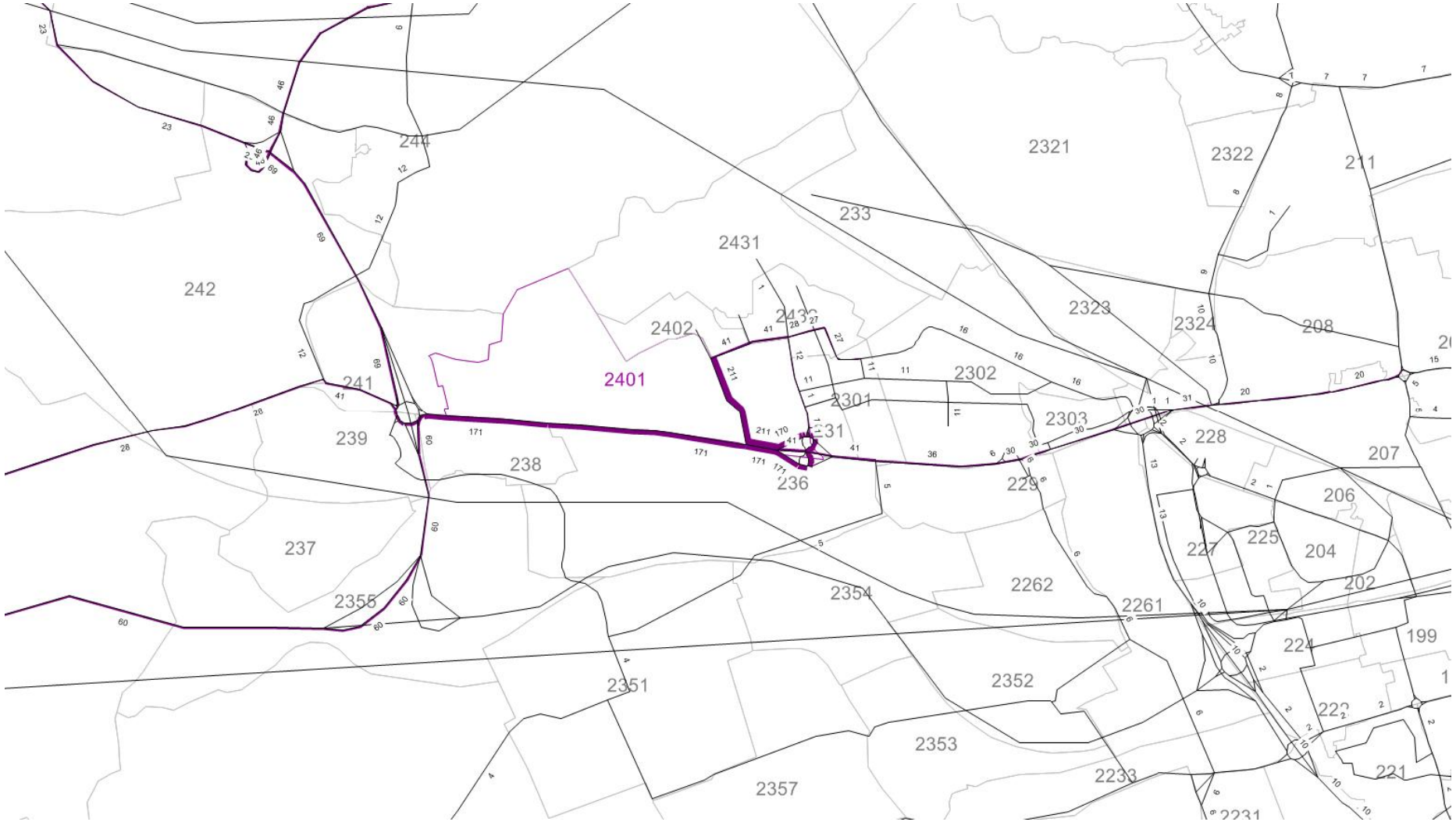


Figure A.15: Zone 2401 RHASS PM origin select link

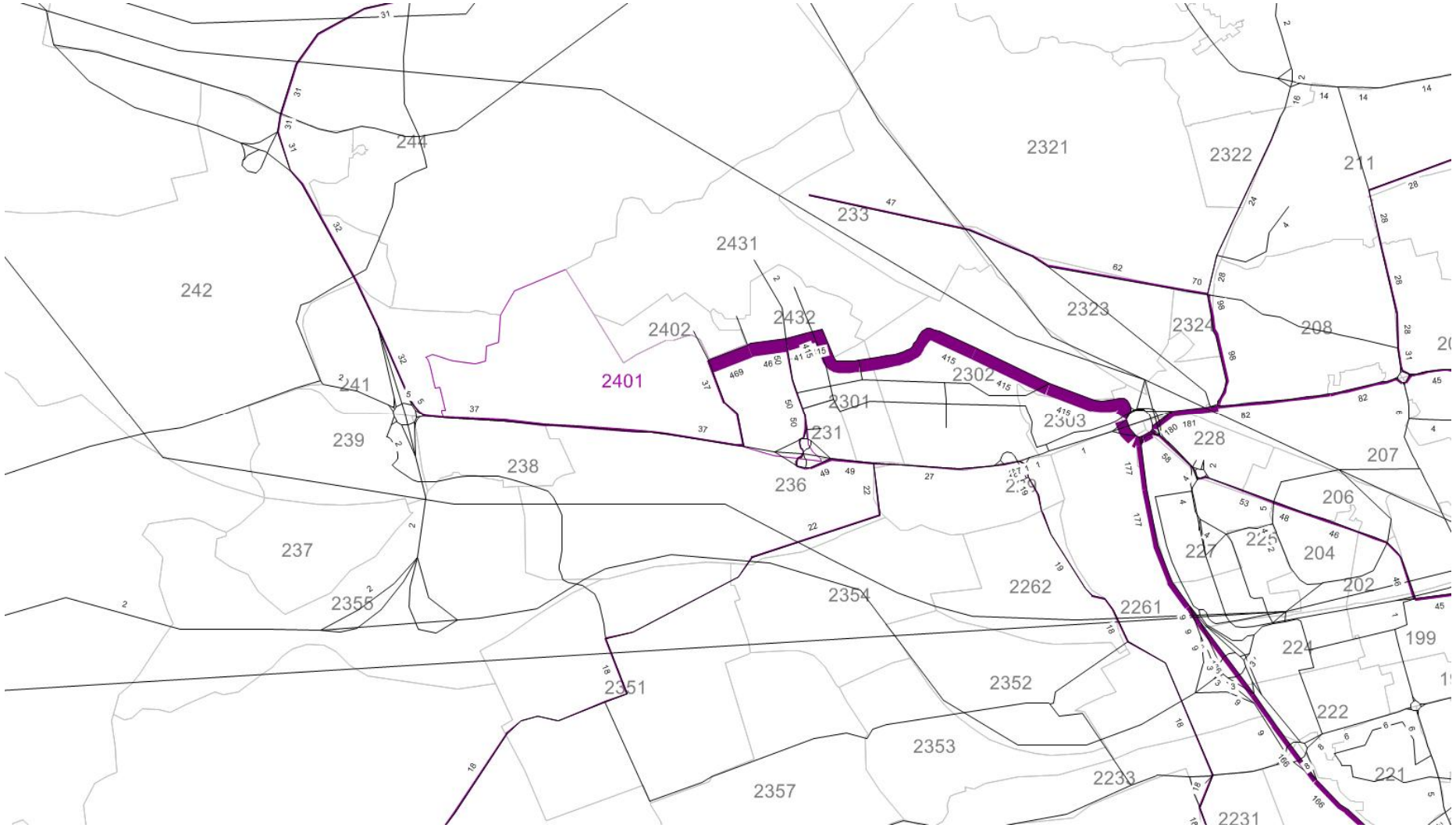


Figure A.16: Zone 2401 RHASS PM destination select link

Appendix E. Infrastructure Costs

Table E.1: Cycle infrastructure package

Scheme Name	Scheme Description	Recommendations/Issues	Development / fee Costs 10%	Development on Private Land	Potential Cost excluding Optimism Bias	Potential Cost including 44% Optimism Bias
A8 North side missing link	New cycle way construction over water course and carriageway.	The cycle route is feasible, although further geotechnical information is required to establish bridge construction.	£53,700	N/A	£537,500	£773,900
Improvements to Gravel path (old railway line) from A8/M9 interchange north to Kirkliston	Construction of cycle route.	Feasible option, option does not require excavation; however, site investigation will confirm this.	£31,800	£100,000	£317,600	£457,300
Cycle Connection from A8 along Eastfield Road into Airport	New shared use footway, from roundabout to airport	Is feasible, either new footway due to potential carriageway widening.	£48,100	£100,000	£481,500	£693,300
New pedestrian / cycle bridge over railway between West Craigs and Edinburgh Gateway	New pedestrian bridge over railway	Feasible and included within Local Development Plan. Potential for dual public transport use improving local connectivity	£300,000	N/A	£3,000,000	£4,320,000
Improved Crossings at Turnhouse Road and Maybury Road for designated cycle path	Widening and relocation of crossing facilities to incorporate cyclists, conversion to toucan signals	This looks feasible, but would need checking with topographical survey and AutoTRACKING vehicle movements. A lot of the cost here would be new signal equipment and traffic management given the location.	£11,000	N/A	£110,000	£158,400
Improved access between Ratho Station and A8 along station road	Installation/widening of existing footpath on west side of road to improve access for cyclist between primary school on Station Road and A8.	This is feasible by widening into existing verge along the route, but would need some land take. Private fence would need removing and re-erecting. A short section where widening is not possible due to housing fronting onto footway.	£45,800	£100,000	£458,200	£659,800
Improved Station Road/A8 bridge access for cyclists.	At the moment cyclists have to dismount to go over pedestrian bridge over A8 which is not cycle friendly.	Improving bridge access for cyclists isn't really feasible due to site constraints with buildings etc. Signalised junction at A8/Station Road would be needed. This would allow cyclists to cross carriageway and also allow right turns for traffic out of Station Road. Thus would however need modelling to determine impact on traffic flows. Removal of footbridge proposed	£44,100		£440,800	£634,800
		Total cycling:			**£5,345,600**	**£7,697,500**

Table E.2: Public transport infrastructure package

Scheme Name	Scheme Description	Recommendations/Issues	Development / fee Costs 10%	Development on Private Land	Cost excluding Optimism Bias	Cost including 44% Optimism Bias
Broxburn to Newbridge Roundabout	Carriageway widening and footway re-alignment	Issues include; Viaduct restricting c'way widening, buses at junction to industrial estate may impede traffic turning left, STATs within verge at Newbridge end, Controlled crossing facility seems to be placed in the middle of nowhere, c'way on bridge cannot be widened, however, there is space for bus lane and footway, although this will need to be verified	£312,500	N/A	£3,124,700	£4,499,600
A8 westbound Station Road to Newbridge Interchange	Carriageway widening and footway re-alignment	Feasible, bus lane and footway is possible, although widening not possible alongside resident properties	£111,300	£100,000	£1,112,700	£1,602,300
A8 eastbound bus lane from dumbbells to Maybury Junction	Carriageway widening for implementation of bus lane and shared use footway re-alignment	Is a feasible option, however, would recommend adjusting extents (getting rid of small sections of bus lane) as some sections may be confusing for drivers. Land take is likely throughout the scheme	£256,800	£100,000	£2,567,700	£3,697,400
Bus Lane Under Gogar Roundabout	Modify existing carriageway lane to a bus lane	Feasible option if the proposed traffic signals are full time. Scheme closely linked to WSP – Gogar Roundabout Lane Metering. Recommend clearly defined bus lane, use Green anti-skid	£6,400	N/A	£64,100	£92,300
Maybury Road Approach to Maybury Junction	Partial Bus lane and shared use footway/cycleway	Option is feasible, however, fill material is required prior to footway construction	£214,000	N/A	£2,140,400	£3,082,200
Improved bus priority linking South West Edinburgh with the Gyle, IBG and airport	Improved bus priority at South Gyle Broadway / Gyle Access. Additional northbound lane towards A720	Partial signalisation of Gyle access proposed to minimise impact on tram crossing	£448,000	N/A	£4,480,200	£6,451,500
Upgraded Bus interchange facility at Ingliston P+R	Improved public interchange facilities including improved bus stances, layover and facilities. Improved tram shelter / canopy. Cycle parking	Reconfiguration to better link tram and bus interchange and facilitate bus to bus interchange. Greater land take of facilities may require reconfiguration of P&R spaces	£300,000	N/A	£3,000,000	£4,320,000
Kilpunt Park and Ride	New Park and Ride site (500 - 800 spaces)	Guide price only	£550,000		£5,500,000	£7,920,000
New Tram Stop	Installation of new tram stop (footprint already exists)	as WETA report	£100,000	£0	£1,000,000	£1,440,000
		Total public transport:			**£22,989,800**	**£33,105,300**

Table E.3: Road infrastructure package

Scheme Name	Scheme Description	Recommendations/Issues	Development / fee Costs 10%	Development on Private Land	Cost excluding Optimism Bias	Cost including 44% Optimism Bias
Link Road Part 1 Dual Carriageway	Dual carriageway option from Gogar to first roundabout	Requires area in cutting due to airport flying zone regulations. Assumes existing bridge at Gogar roundabout to tram depot is wide enough for dual carriageway. Includes widening bridge deck of Gogar over Tram Stop to dual over bridge. Widened deck area would accommodate pedestrians and cyclists	£630,098.77	N/A	£6,301,000	£9,073,400
Link Road Part 2 Single Carriageway	Airport Link road from dual carriageway link into Airport– single carriageway option	Issues with fencing/buildings. Airport internal roads would likely need reconfiguration to make it work	£281,389.55	N/A	£2,813,900	£4,052,000
Segregated Link Road cycle route			£111,500.00		£1,115,000	£1,605,600
Development Link Road Single Carriageway (Main Street)	Development access road adjacent to new development linking new link from Gogar to Eastfield Road. 3m Flagged footway either side of carriageway.	Requires signalised junctions assumed 5no for cost estimate. Do not envisage many issues with statutory undertakers	£563,489.96	N/A	£5,634,900	£8,114,300
Dualling of Eastfield Road Phase 1	Dualling from Dumbbells to IBG new access to include priority bus	Feasible option. STAT diversions likely	£180,286.64	£100,000.00	£1,802,900	£2,596,100
Dualling of Eastfield Road Phase 2	Dualling from IBG new access into Airport to include priority bus. 3m Flagged footway either side of carriageway.	Private land take is required for this option. Further detailed study required	£114,298.24	£100,000.00	£1,143,000	£1,645,900
Newbridge additional lane from M9 onto A8	Carriageway widening and lining works	Feasible option	£120,302.80	N/A	£1,203,000	£1,732,400
MOVA improvements at Newbridge/Dumbbells Gogar/Maybury	Signal improvements, without any civil engineering works	Improvements may not be as great as undertaking works to improve lane widths etc. at the same time	£86,520.00		£865,200	£1,245,900
Dumbbells Roundabout Improvement	Carriageway widening and dedicated bus lane and new signals	Able to widen within roundabout and add additional lane under bridge. Existing footway widths maintained	£151,000.00	N/A	£1,510,000	£2,174,400
Dumbbells westbound off-slip signals	Signal on westbound off-slip towards southern dumbbell	Proposed to improve westbound roundabout entry opportunities minimising queuing on A8	£58,130.74	N/A	£581,300	£837,100
A8 Gogar Roundabout - 4 Lane Northern Circulatory Improvement	Carriageway widening on western side of roundabout to accommodate extra lane	Widen carriageway into roundabout and resurface the entire roundabout. Includes for new high containment VRS on bridge as traffic is moved a lot closer to existing parapet. This option excludes any structural alterations to the existing overbridge	£169,915.05	N/A	£1,699,200	£2,446,800

Scheme Name	Scheme Description	Recommendations/Issues	Development / fee Costs 10%	Development on Private Land	Cost excluding Optimism Bias	Cost including 44% Optimism Bias
A8 Gogar to Maybury additional eastbound traffic lane	Extra eastbound traffic lane between Gogar roundabout and Maybury	Major works to Gogar to include potential new slip roads and major structural works. Potential high utility diversion costs including Fibre Optics	£2,083,333.33	N/A	£20,833,300	£30,000,000
CEC Maybury Improvement Scheme			£129,452.57	N/A	£1,294,500	£1,864,100
		Total road improvements:			**£46,797,200**	**£67,388,000**