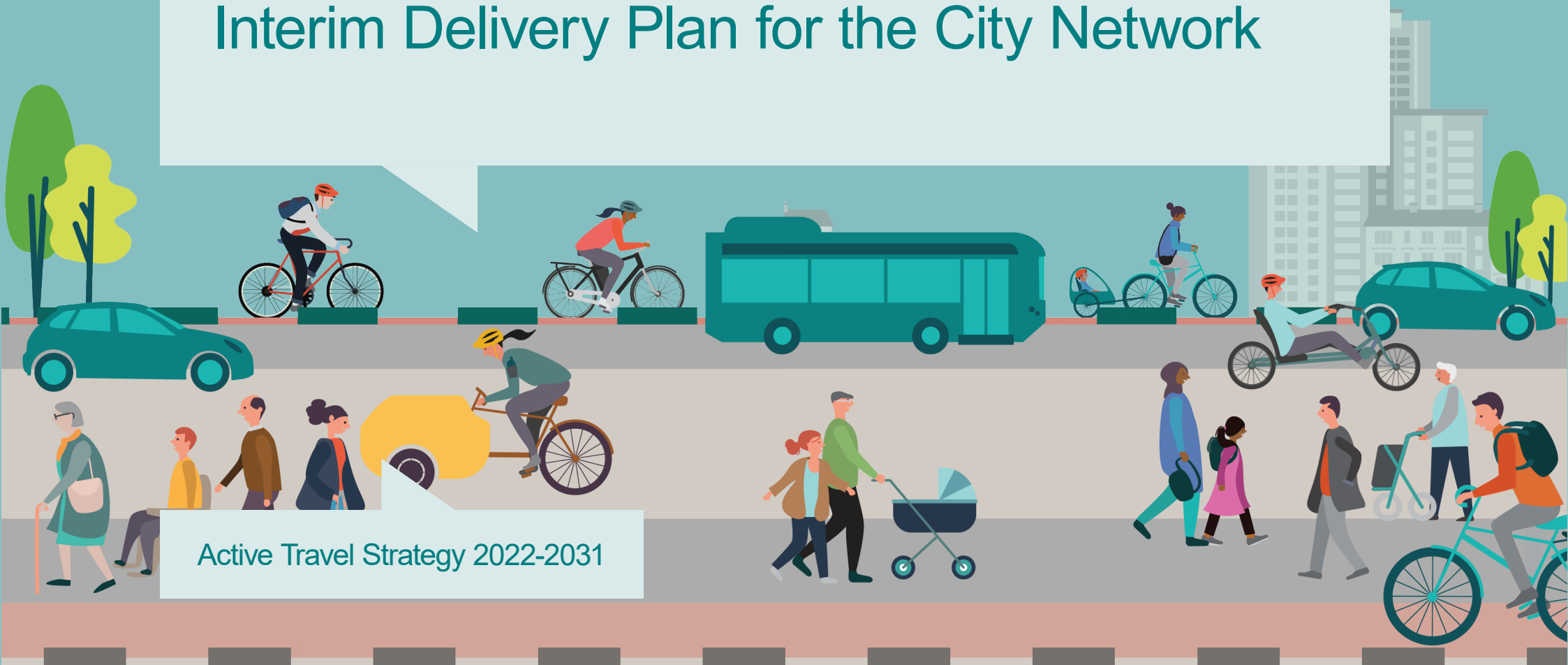
Glasgow CITY COUNCIL

Connecting Communities

Connectivity, People and Place:

Interim Delivery Plan for the City Network



Active Travel Strategy 2022-2031

Contents

Foreword

The Active Travel Strategy 2022-2031 creates a step change for Glasgow in how we will move around our city and in the design of our streets and public spaces. It is a direct response to the climate emergency and the City Council's commitments to achieving net zero carbon and zero deaths and serious injuries on our roads by 2030.

One of the key activity strands in the Active Travel Strategy is changing our street environments to enable people to walk, wheel and cycle more for everyday journeys. That will include the development of a City Network of active travel routes across the city, in tandem with other actions such as through the Liveable Neighbourhoods programme, to improve streets and spaces within our local communities.

This delivery document sets out how that City Network will be designed, developed and delivered rapidly over a 10 year period. We will not compromise on safety: accessibility and inclusion are core to our approach. But to make sure we deliver in the 10-year timescale, we will focus our attention on key areas of interaction such as junctions and bus stops, and on segregation from traffic.

The timescales for completion of the City Network are ambitious, but given the urgency of the climate emergency it is vital that we deliver at pace and scale. The climate emergency requires nothing less.

Councillor Anna Richardson in George Square.

Councillor Anna Richardson
City Convener for Sustainability and
Carbon Reduction

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Introduction

1. Introduction

1.1 Aims of the City Network

Glasgow City Council has set out a vision to create high quality, pleasant, dense cycle infrastructure designed to comply with updated Cycling by Design guidance (Transport Scotland, September 2021). This network will enable easy cycling across Glasgow and to neighbouring towns, green spaces/routes and public transport.

The City Network will be well lit and routed through busier areas providing higher levels of passive supervision, so people feel as safe as possible using it at night. It must minimise conflicts between people moving around the city in different ways; that means that inclusive design will be embedded in the design of the City Network. Where necessary, space for the City Network will be reallocated from unsustainable transport modes, whilst taking a balanced approach to work with improving public transport and footways.

The aims of the City Network are:

- Enable direct clear active journeys to everywhere in Glasgow for everyone in Glasgow.
- Eliminate traffic danger as a reason not to cycle.
- Improve ability of Glasgow's road network to enable movement of people and goods.
- Be usable all year round.
- Encourage demographic use which is representative of Glasgow (e.g. 50% women).
- Provide easy access to Glasgow's green network of canals, rivers, parks and old railways.

How the City Network will achieve these aims and objectives is fleshed out in this delivery document, based on principles contained in the Active Travel Strategy. These include:

- Creation of a continuous, coherent network which offers direct journeys.
- Delivery of a functional network by 2030, building out from existing and planned infrastructure and learning delivery lessons from other cities and from experience in Glasgow (particularly the Spaces for People programme in 2020-21).

The City Network will be delivered alongside other elements of the Active Travel Strategy and the wider Glasgow Transport Strategy, such as improvements to bus journeys along the city's sustainable transport corridors.

Glasgow Active Travel Strategy 2022-2031

"We will build on the active travel infrastructure developed over the last decade to create a coherent cycle network across Glasgow. This City Network will provide people with high quality infrastructure that keeps them safe from motor traffic and provides a smooth, direct and comfortable journey. We will continue to improve on existing designs and learn lessons from the "Spaces for People" temporary lanes created during the pandemic to deliver high quality infrastructure quicker. This will enable the opportunity of the proposed network of segregated cycle infrastructure to be in place by 2030."

Outline of the City Network

The City Network will be consulted on, designed, and implemented to achieve a functional coherent citywide network by 2031. It will build out from existing and planned infrastructure and tie in with the regional Active Freeways programme and National Cycle Network upgrades.

The map opposite shows the density of network required so that almost everyone in Glasgow lives within a few minutes easy cycling of a route. The network is set out to enable people to travel by cycle from anywhere in Glasgow to everywhere.

Delivering such a network is ambitious but possible. However, success relies on continued funding for delivery of the network and leadership to support continued delivery. Our experience from Garscube Road and Victoria Road active travel projects is that for Glasgow, people will mode shift to active travel if enabled through high quality continuous infrastructure.

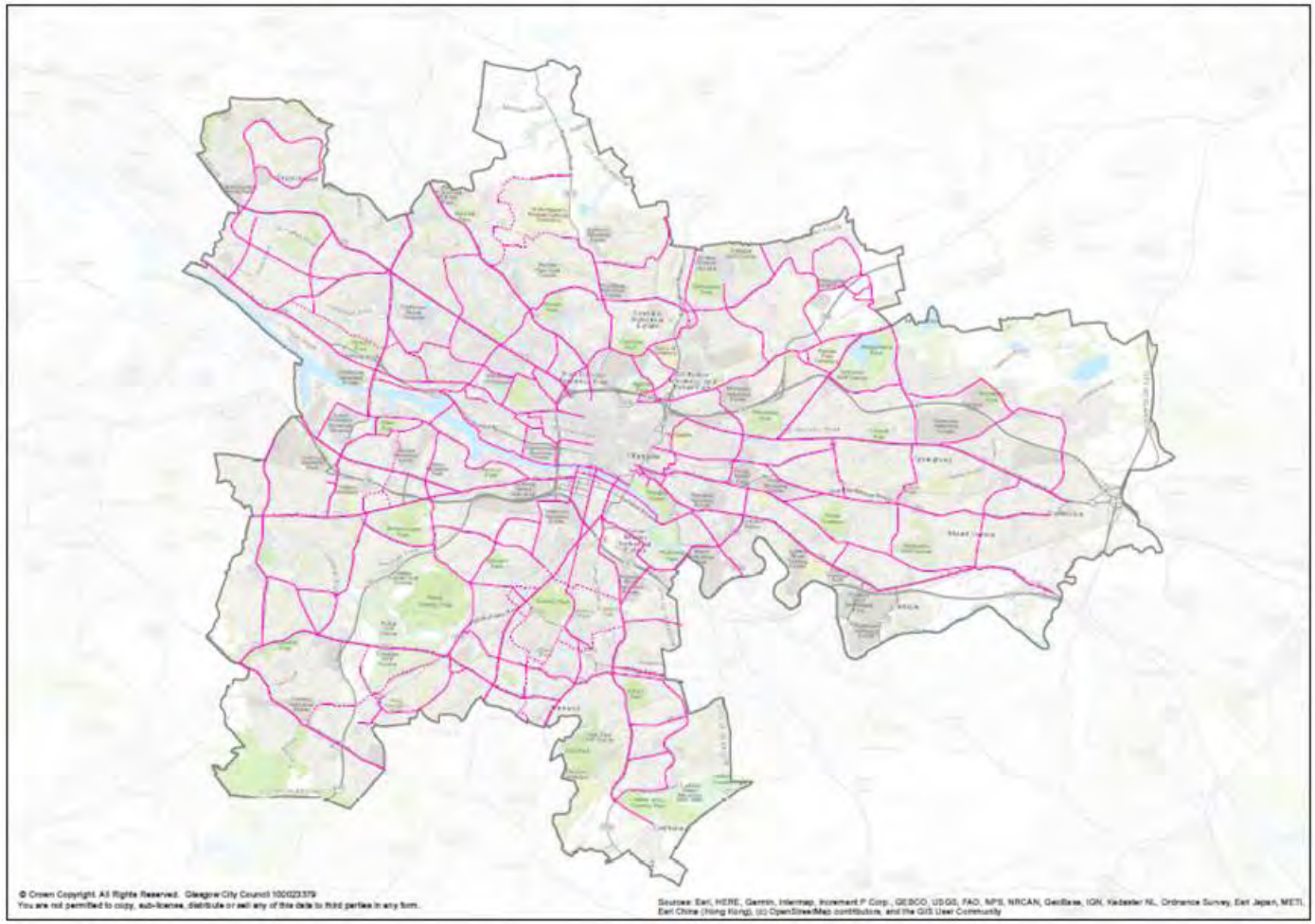


Figure 1.1: Map of proposed City Network across Glasgow showing initial outlines of the routes that the network might take.

1.2 The Case For Change

Public Policy

The Scottish Government and Glasgow City Council have announced a climate emergency. The Scottish Government has committed to a carbon neutral Scotland by 2045, and Glasgow City Council has committed to a carbon neutral Glasgow by 2030. To help deliver that, the Scottish Government has committed to vehicle traffic reduction of 20% by 2030. Glasgow City Council has committed to vehicle traffic reduction of at least 30% by 2030.

Delivering these commitments will require deep transformations in our lifestyles and our economy. The Scottish Government report "De-carbonising the Scottish Transport Sector" (September 2021) spells out the scale and scope of the change required in terms of transport and movement, emphasising the importance of behavioural change – which is at the very heart of Glasgow's Active Travel Strategy. The ways that we move around our cities, and the design of our streets and public spaces, are a fundamental part of ensuring behaviour change.

The City Network, together with other elements of Glasgow Transport Strategy, will transform our streets and spaces over the next few years. Those transformations will be a direct, tangible contribution to the climate emergency that will be visible to every citizen and support them to reduce their carbon emissions.

As well as enabling everyone to contribute to tackling the climate emergency, City Network and associated programmes will tackle poverty and inequalities, enhance the city's economy and make our city safer and more welcoming - objectives where were given immense support by thousands of citizens in response to the Public Conversation on the future of transport in the city in 2020. As part of the city's Active Travel Strategy, the City Network also contributes to Scottish Government policy objectives including the draft National Planning Framework 4, the 20 Minute Neighbourhood concept for local living and the Place Principle.

The Economic Case

Data analysis undertaken in preparation of the Strategic Business Case for the Active Travel Strategy indicates that although active travel is increasingly popular in Glasgow, it is at a low level compared to other European cities. The introduction of physical infrastructure such as the City Network is likely to have a considerable impact in achieving this objective.

Achieving a shift towards active modes would have a significant impact in achieving numerous policy objectives such as reducing carbon emissions, enabling more inclusive accessibility and improved connectivity between neighbourhoods. For example, data analysis provides clear evidence of lower levels of cycle commuting to work in lower income neighbourhoods despite it being a relatively cheap way to travel (particularly if the capital cost of purchasing a cycle can be spread).

The Strategic Business Case has appraised the direct, indirect and opportunity benefits of implementing the Active Travel Strategy. The high-cost capital estimate for the entire Strategy, including the City Network, is £475 million. The initial estimate of benefits over a 10-year period is £1,843 million (2018 base). This gives a cost:benefit ratio of between 3 and 4, a high figure which is in line with evidence of similar interventions elsewhere (and is likely to increase as accident rates drop, so providing further benefits). This suggests a strong case for investment in the City Network.

Health

Enabling people to travel actively generates significant public health benefits – and not just for those travelling.

The City Network will reach every neighbourhood in the city, and enable everybody to enjoy direct active travel routes to a range of destinations. Health professionals recommend children and young people get at least 60 minutes of vigorous activity every day, and adults at least 20-30 minutes. Any increased activity provides individual health benefits including reduced risk of coronary heart disease, stroke, cancer, obesity and type 2 diabetes, improved musculoskeletal health and mental wellbeing; the prevalence of these issues in Glasgow is well established. In 2011 over 46,000 Glasgow residents were active commuters; even with that relatively low level of participation in active travel, the economic benefit of reduced mortality was estimated to be £136 million.

The health and well-being benefits of active travel will be felt in other ways too – and by all citizens, not only those who are walking, wheeling and cycling. Approximately 350 deaths per year can be attributed to air pollution from small particulate matter (PM2.5). The primary cause of air pollution in Glasgow and other UK cities is from motor traffic. Switching to electric vehicles will help but will not solve the problem on its own: they too produce particulate emissions, and switching to electric vehicles does not contribute to Glasgow's commitments to a minimum 30% traffic reduction and zero road accident fatalities and serious injuries by 2030.

Inclusive Design

Our networks and connections need to be planned and designed to create inclusive, enabling environments for all to enjoy the benefits of active travel across the city. This means introducing more benches and resting opportunities, clearer footways, dropped kerbs and level footways, and better crossings. Appropriate accessible parking and drop-off locations should also be available in our streets and destinations.

The City Network presents an opportunity to deliver all these important interventions to improve the accessibility of our streets. For example, as the City Network is rolled out crossings will not only be introduced but existing ones modernised to ensure they have good quality dropped kerbs as well as correct tactile paving and introduce tactile cones where missing.

Figure 1.2: Pedestrian light push button, light is currently showing a green safe to cross symbol

1.3 Funding

The City Network and associated public realm works has an estimated maximum cost of £475 million. A step change in travel behaviour and infrastructure delivery requires an associated step change in funding.

In the past, a range of funding mechanisms has been used to deliver active travel infrastructure in Glasgow, many of which have involved competing for relatively short term project funding. Delivery of the City Network on such funding models is neither appropriate nor sustainable. However, significantly more funding for active travel investment is now being allocated by the Scottish Government, which gives the opportunity to work in partnership with other partners in the city region to deliver a large scale long term project like the City Network.

For example, Transport Scotland's national Strategic Transport Projects Review 2 (STPR2) emphasises the importance of active travel to Scottish Government's transport investment programme over the next twenty years. A key element of STPR2 is the Active Freeway programme which aims to deliver high-quality, direct, segregated active travel in Scotland's urban areas. The City Network is an excellent fit with this programme's key themes, with the Active Travel Strategy providing complementary behavioural change support. The City Network will also contribute to other proposed STPR2 interventions such as influencing travel choices, neighbourhood placemaking and mobility hubs.

Long term success of the City Network will rely on active maintenance of the new infrastructure, which will require a transition of schedules and equipment by the City Council. We will continue to work with funders to deliver sufficient capital and maintenance budgets, including building resilient long term funding mechanisms

Figure 1.3: Front cover of the Strategic Transport Projects Phase 1 Recommendations report

Smarter Choices, Smarter Places

Supporting Sustainable Travel

Figure 1.4: Graphic logos of the Smarter Choices, Smarter Places scheme.

2

Learning from Experience

2. Learning From Experience

The Active Travel Strategy sets out a number of high level aims and objectives for the design of the City Network, as summarised in the Introduction to this document. These are further developed later in this document in Design and Delivery Principles (section 3), Design Outlines (section 4) and 10 Year Delivery Strategy (section 5).

There is much to be learned from our own experiences and from other cities, as this section shows.

Our design and delivery will take account of the latest approaches and techniques, based on evidence and data of what works elsewhere in the UK and abroad. This section summarises some of that important learning, highlighting factors which are particularly relevant to Glasgow.

2.1 Lessons From Elsewhere

Glasgow is in the fortunate position of being able to learn from other cities which have already embarked on producing their own equivalents of the City Network. The following European cities offer particular lessons for Glasgow, and these are summarised later in this section:

- Paris demonstrates the need to build a cohesive network to achieve significant modal shift.
- Seville offers useful learning for deliver of a citywide network in approximately 10 years, as intended in Glasgow.
- Copenhagen shows the importance of governance, political leadership and commitment in delivering change.

The International Cycling Infrastructure Best Practice Study (Transport for London, 2014) summarises key lessons derived from on international research covering 16 cities in the UK, Europe, North America and New Zealand, and this is summarised on the following pages.

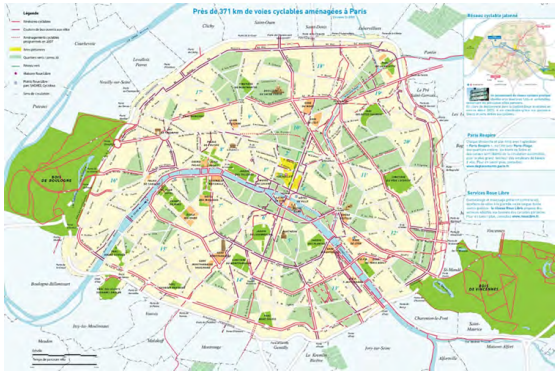
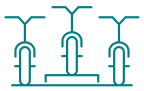


Figure 2.1: Map of the proposed Paris Cycle Network

Figure 2.2. Map of Copenhagen Cycle Network

Liveability

Good conditions for cycling, and resulting high levels of cycling, are only found where the city's political and technical leaders consider that increasing the mode share of this form of transport is beneficial for the city in economic, social and environmental terms; and part of an overall approach to enhancing city liveability.



Leadership

This leadership is critical because creating good conditions for cycling may mean taking highway space currently used for moving or parked motor vehicles; and this often draws local public opposition even in cities with very high levels of cycle ownership and use.

Governance

Systems of governance relating to transport vary between cities. Those with comparable systems to London (i.e. with a strong strategic authority able to lead by example on its own highways, and to appropriately influence the boroughs through that leadership) seem to have the best structure for improving conditions for cycling.

Long Term Commitment

Cities with the largest cycling levels and most cycling-friendly street use cultures have achieved that status as a result of policy and associated action over the long term, with an incremental approach to improving provision. Continuity of commitment to cycling as a desirable and benign mode, one worthy of major investment, is essential.

Incremental Change

Some cities have shown that it is possible to grow cycling levels significantly over just a few years by employing pragmatic, relatively inexpensive, and sometimes intentionally 'interim' means of securing space for cycling. Upgrading this infrastructure to the standard found in mature cycling cities is not precluded (and sometimes consciously provided for) by the measures initially used.

Infrastructure Principles

In terms of infrastructure, there are some very clear and sound principles underlying the design of measures in the best cycling cities. However, there is no single physical 'model' that is either clearly optimal or directly transferable. Each city has applied the principles in a way that has been the best fit (e.g. politically for the whole city, or technically for any given street) at the time of intervention.

Protection + Separation

The cities with the highest cycling levels, and those that have successfully grown cycling levels over relatively short periods, generally afford cycling good physical protection or effective spatial separation from motor traffic, unless traffic speeds and volumes are low.

Similarities + Differences

While there is, therefore, generally quite a strong 'common language' of cycling infrastructure provision across successful cycling cities, there are differences in 'accent' that can be quite important. A good example of this is the way in which different cities make provision for opposed turns by cyclists at signalised junctions.

Avoiding Jargon

Care needs to be taken in the use of certain terms, as confusion or over-generalisation can arise. For example, different terms to describe forms of cycle segregation, like 'hybrid', 'light', 'semi' and 'soft', have begun to abound, although their meaning is by no means easily or commonly understood.

Avoiding Compromised Designs

Cities that are serious about growing cycling do not employ measures that are obvious compromises, such as cycle lanes that are too narrow to be fit for purpose, operate only part-time, and/or terminate abruptly or with a hazardous merge.

Legal + Regulatory Scope For Change

In almost every study city, the legal framework, and associated signal control methods, generally provide for much greater flexibility in terms of designing for cycling than is currently the case in the UK. While the scope for positive change in providing for cycling in the UK is constrained to some extent by existing highway regulations, all the study cities visited provide good examples of how better cycling provision can still be made within a less conducive regulatory framework.

Streetscene Impact

Cycling infrastructure can successfully be designed as an integrated part of the streetscape – although there are also unsuccessful examples of this. Though a mode of transport that is highly desirable to encourage, cycling in cities is primarily a means to an end. Provision for cycling should do as much as it can to contribute positively to, and not to detract from, the wider experience of being in a city. While it is important that aesthetic concerns do not compromise the practical utility of cycle infrastructure, it is also important that purely functional considerations should not compromise the attractiveness of streets for all users.

Pedestrian-Cyclist Interaction

In intensely cycled cities, the interaction of cycle traffic with pedestrians can sometimes seem disorderly to UK eyes. However, no evidence was found of specific safety problems arising from such interaction; and people seem generally to have learned to negotiate harmoniously with one another at close quarters. However, the views of pedestrian user groups were not canvassed as part of the study.

Driving Cultures

In cities with more mature cycling cultures, drivers were found to be respectful of cycling and observant of the rules of the road. It is suggested that better driver behaviour is a general product of more liveable cities, and specifically the result of a virtuous relationship involving good cycling infrastructure, a supportive legal framework, and growth in the number of people cycling.

Cycle Parking

Making adequate provision for cycle parking is a high priority in all well-cycled cities. Even where cycle theft is not considered a major problem and fixed stands are not a requirement, simply finding the necessary space (on or off street) can be a significant challenge.

Case Study 1: Paris

Paris began to take steps to introduce cycling infrastructure in the city in 1996 when it installed the first 50km of cycle lanes. By 2010, Paris had a 440km cycling network that spanned the city and it now has more than 1,000km of safe cycle paths including around 52km of “coronapistes” that were temporarily introduced during the pandemic. It plans to make these permanent and add another 130km of safe paths to encourage people to cycle in the city.

A major milestone in promoting a culture of cycling was the launch of its cycle hire scheme (Vélib) in 2007. The city now has a fleet of over 20,000 bicycles in 1,800 stations across the city to address the difficulty of owning a bike in a Paris apartment.

Strong political leadership has enabled this to happen. The Mayor of Paris was elected for a second term in 2020 after introducing several pro-cycling and pedestrian-friendly measures to the city. Paris has already spent €150 million on an initial bike plan that was praised as the start of a “revolution” for the city.[1]

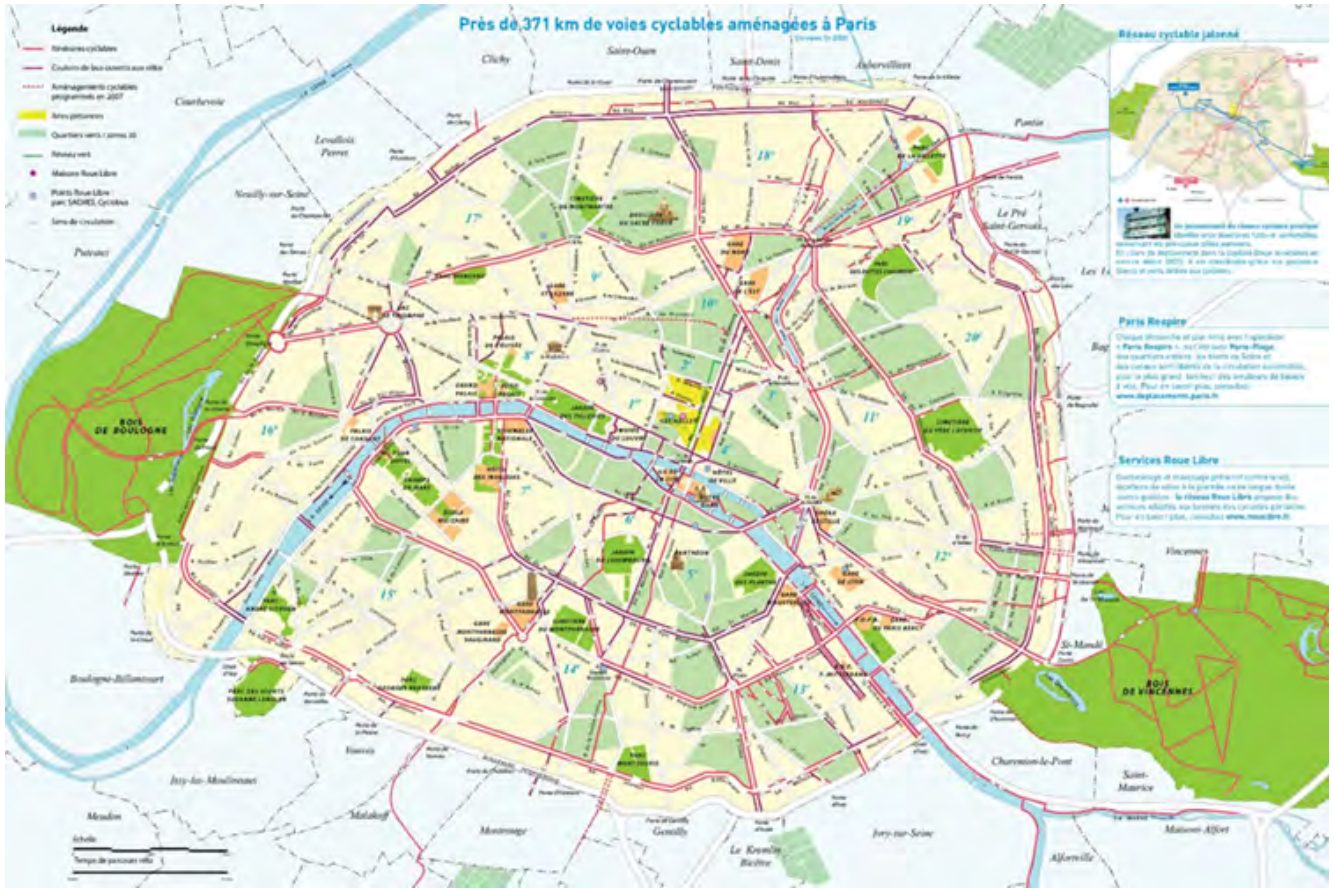


Figure 2.3: Enlarged map of the proposed Paris Cycle Network

1. https://www.euronews.com/green/2021/10/25/paris-is-investing-250-million-to-become-a-100-cycling-city

Figure 2.4 Photo of people cycling and walking along the River Seine in Paris. The route used to be for car traffic but now reserved for active travel.

Key achievements include:

- Since 2016, the left bank of the River Seine has been free of motor traffic
- Cycle counters recorded an increase in cycle paths by 47% on average between 2019 and 2020 and by 22% between 2020 and 2021
- Camera counts shows peaks of more than 25,000 cyclists and scooters per day on the rue de Rivoli
- Since 2019, certain Parisian boulevards have been used by more cyclists than motorists during rush hour.
- Bus lanes that are over 4.5m wide are available to all cyclists
- Following on from the Plan Velo 2015-2020, Paris' Mayor announced plans to make Paris 100% cycle friendly by 2024.[2]

The strategic actions to deliver the aim of becoming 100% cycle friendly include:

- Investment in cycling will be increased to €26 per inhabitant per year – a total of €350 million in six years.
- At least one cycle route will be created in each borough: a street where pedestrians and bikes have priority over motor vehicles
- Two-way cycling will be introduced in 30mph zones
- All bridges will have cycle paths
- The implementation of the Vélopolitain and the RER V – a new network of major cycle routes – in addition to the 1,000km of routes that already exist
- Enforcement of the Street Code, which gives priority to the most vulnerable, pedestrians and cyclists
- Regulation of access for heavy goods vehicles which are not equipped with an anti-blind spot
- Installation of secure Vélostations in 15 Parisian stations to promote train / RER / metro and bike interchange
- Installation of Véloboîtes for secure residential parking of bikes equipped with free access to cycle repair tools
- 72% of on-street car parking spaces will be removed

2. Mayor announces plans to make Paris 100 per cent cycle friendly by 2024 (intelligenttransport.com)

Case Study 2: Seville

Seville has a network of around 180km segregated cycle routes which connect the suburban area with the city centre. The majority of Seville's cycle network was implemented in only two years and the network made it possible to cycle from almost everywhere in the city right after it had been implemented. Seville combined a widely supported social movement with strong political will from the local administration to provide a cycle network that has safe cycle tracks that are fully segregated from car traffic. More than 70,000 trips are made daily along this network on a typical business day. This compares with 6,000 trips made by cycle in 2006.[3]

Most of the cycle routes are bidirectional and are built on former parking lanes raised to the level of the pavement. This makes it safer for cyclists and harder for subsequent governments to turn the path back into parking.

To encourage more cycling a bike-sharing system was introduced in 2007, with 2,500 bicycles in 250 docking stations spread throughout the city.

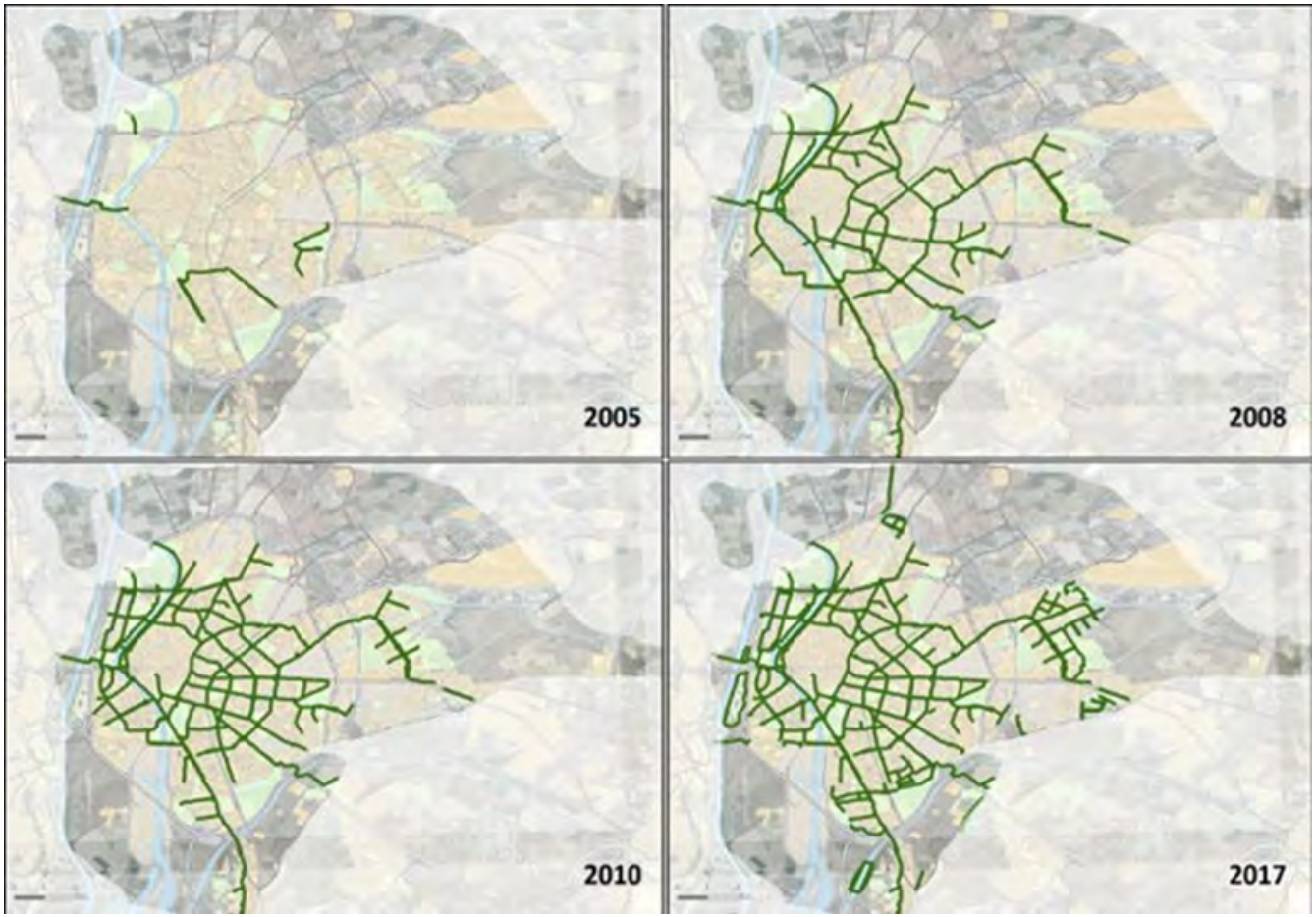


Figure 2.5 Maps showing Seville's sequential growth of the cycling network from 2005 to 2007.

3. https://ecf.com/news-and-events/news/seville-success-story-contramano-turns-25

Figure 2.6 Person is cycling towards the camera on a green cycle route in Seville. The cycleway is separated from carriageway by bollards and the footway protected from cycleway by tree and planter strip.

Some of the lessons learned in Seville include:[4]

- Make a connected network, not isolated cycle routes
- Make your network fast: people will feel it is useful
- Make your cycleways visible and easy to recognize with a uniform design
- Make your cycle routes safe: protect them from traffic
- Connect the main trip attractors with the main residential areas
- Two-way cycle routes are better than one-way (to begin with)
- If there is car parking, the cycle routes should come between parked cars and pedestrians.

4. https://ecf.com/files/wp-content/uploads/Lecture57marques.pdf

Case Study 3: Copenhagen

Copenhagen has successfully managed an urban transformation process from being a car-centric city in the 1970s to becoming a global role model for cycle-oriented planning. The lessons learned from Copenhagen can be summarised under two areas: governance, and political leadership and commitment.[5]

- **Governance:** Copenhagen has successfully reduced and minimised conflicts between urban and transport planning by taking an integrated approach across departments and agencies.
- **Political leadership and commitment:** In Copenhagen cycling is increasingly the norm for most residents. Promoting a culture of cycling and supporting that with sufficient resourcing and planning commitments has been crucial to this success.

Copenhagen has a planned network of cycle highways to 2045 that comprises 45 routes and 746km.[6] The existing network is 176km. The main aim for the infrastructure is to provide a coherent, high-quality network without any weak links in the network.

The city has a target that in 2025 there will be a PLUSnet for cyclists, consisting of Green Routes, Cycle Superhighways and the busiest cycle routes. The PLUSnet will be of a high quality, including at intersections and be well maintained so that cyclists can travel securely and comfortably at the speed that suits each individual.

Figure 2.7 Enlarged map of Copenhagen Cycle Network

5. https://www.ebrdgreencities.com/policy-tool/cycling-strategy-copenhagen-denmark-2/
6. https://cyclingsolutions.info/embassy/danish-cycling-statistics/

Figure 2.8 Person cycling down a residential street in Copenhagen. A tree and sitting place are in the middle of the street.

Copenhagen's key cycling statistics are impressive:

- The number of kilometres cycled has risen by around 30% since 1998
- 150,000 people cycle each day to work or educational institutions
- The number of cyclists increases by 23% when a cycle route is upgraded to a highway
- In 2018, the number of cyclists crossing the city centre exceeded the number of cars
- People cycling are responsible for 38% of street level shop turnover in the Frederiksberg area

On quieter, more residential streets, cycling is accommodated in a more subtle way. Rather than reserving a dedicated lane separating cyclists from cars, the two modes share the roadway. This, however, is dependent on a speed limit of 20 to 30 kilometres per hour. To simply rely on signage stating the speed limit is naïve. To ensure that car drivers drive at a safe speed, residential streets in Copenhagen have been treated with a variety of traffic calming measures. By narrowing lane widths, tightening corner radii, and using textured surfaces, motorists drive slowly, by design. In this way car drivers and cyclists of all ages and abilities can share the space safely.

Along busier neighbourhood streets, cycle lanes are separated by a simple painted line. In certain situations, the painted bike lane can be an effective way to provide cyclists with a dedicated space, however, cars are also expected to park in between the cycle lane and car traffic, adding an extra level of protection between cyclists and cars.

People of all ages cycle in Copenhagen not only because it's safe, but because it feels safe. Intersections with residential streets are designed to make cycling safer. These are designed to prioritize the more vulnerable road users, pedestrians and cyclists, over cars and trucks. By continuing sidewalks and cycle tracks at a consistent level, the design requires cars to slow down before entering the intersection, rather than having pedestrians look both ways, yield, and step down into the street at every block. At busier intersections cyclists have their own dedicated set of traffic signals. While the cycle signals are generally in sync with the other signals, they are often afforded a couple seconds head start before the cars. This allows cyclists into the intersection first and out of the blind spots of cars and trucks. Many busier intersections feature a setback stop-line for cars. The setback stop-line design allows cyclists to stop a full five metres ahead of car drivers.

With continued investment over the past decades, Copenhagen has started to witness somewhat of a virtuous cycle. With safer infrastructure come more cyclists and this results in a safety in numbers creating increased awareness and visibility throughout the city.

The provision of connected cycling infrastructure across the city is also very important and this includes providing new, dedicated pedestrian and cycling bridges.[7]

7. https://www.visitcopenhagen.com/copenhagen/activities/what-makes-copenhagen-worlds-most-bicycle-friendly-city

2.2 The Glasgow Experience

Paris, Seville, Copenhagen and other cities offer much useful learning to inform the design and delivery of Glasgow's City Network, which is reflected in sections 2 to 5 of this document. The City Network also responds to local context (including existing design guidance and local constraints), and to active travel demonstrator projects implemented in Glasgow over the last decade.

Local Context

To ensure that the City Network contributes positively to the local environment, its design should consider all the usual factors including:

- Historical context
- Climate and topography
- Flood risk, drainage, geology and ground conditions
- Local planning guidance and policy, such as area-specific development frameworks
- Inclusive and accessible design
- Contribution to placemaking

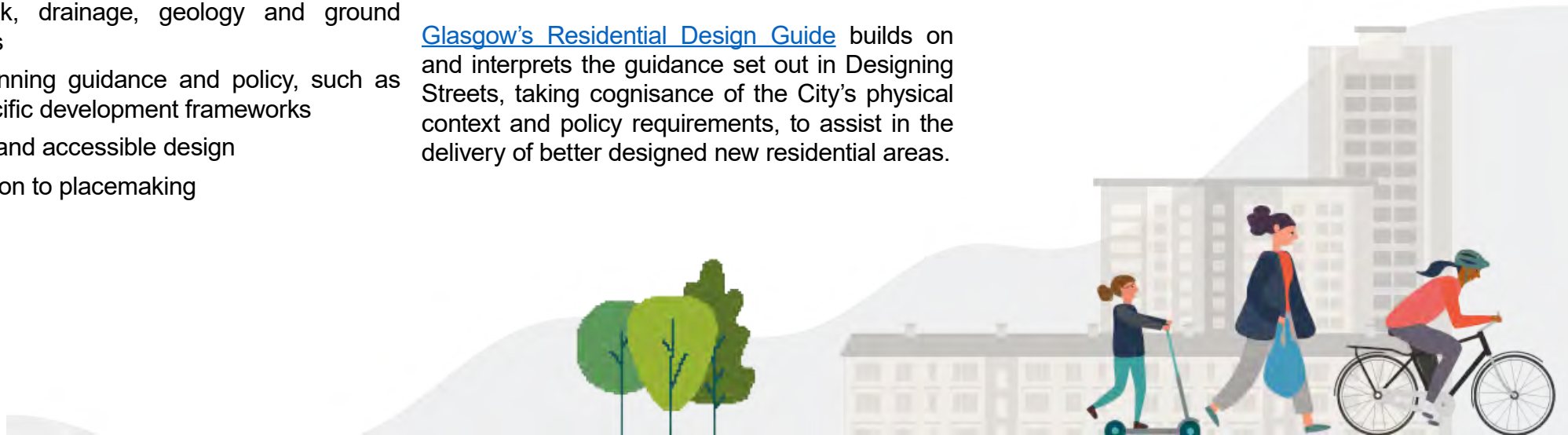
Glasgow Public Realm Design and Maintenance Guide

This provides technical street design solutions with the aim of ensuring that active travel design also contributes positively to placemaking and the public realm. The content of the Guide is reflected in later sections of this document, and it should be used as a reference when developing designs for the City Network.

Glasgow's damp climate is often cited as a constraint to active travel. The reality is that other cities in similar latitudes with similar climates, such as Copenhagen, have been able to achieve significantly higher modal shares for cycling whilst also featuring highly in global liveability indexes. What is important is to ensure that Glasgow's City Network must be safe and useable throughout dark and damp winter days and nights, for example in terms of lighting and materials.

Glasgow's Residential Design Guide builds on and interprets the guidance set out in Designing Streets, taking cognisance of the City's physical context and policy requirements, to assist in the delivery of better designed new residential areas.

Drainage and flood risk are also important, not least because of the local climate. The design of the City Network should contribute as much as possible to reducing surface runoff into the drainage system and standing water. Retrofitting and reducing the amount of impermeable surface is critical, through green infrastructure such as rain gardens, permeable paving and infiltration where the underlying geology permits.



Glasgow's Demonstrator Projects

Glasgow City Council has been successful in implementing cycle routes in various parts of the city over the past 10 years. The design of these routes has evolved, and design improvements have been made as each route has been implemented to take account of feedback and new thinking about design.

Feedback received during the Active Travel Strategy consultation in 2021 highlighted several everyday problems that are of concern to users of the active travel network. This includes broken pavements, missing and tactile paving, missing cones, sub-standard dropped kerbs and concerns about social safety for young people walking to school. It is acknowledged that that these issues need to be addressed as the City Network is further developed and as part of the introduction of Liveable Neighbourhoods.

Initial Cycle Routes

The West City Way and South West City Way provided the first extensive segregated cycle routes in Glasgow. These routes introduced new features into Glasgow's streetscapes such as dedicated cycle phases at junctions as well as trialling ways to manage interaction with pedestrians at bus stops.

West City Way and South West City Way Introduced:

- Kerb segregation between motor traffic and cycle way as well as kerb segregation between cycle way and footway
- Managed interaction between people cycling and people getting on and off the bus
- Dedicated cycling traffic signal stage at signalised junctions

Key lessons learned were that:

- Bus stop boarding platforms should be wider and bus user crossing priority should be clearer (e.g. mini zebra)
- Cycleway and footway surfaces should be upgraded as part of the project
- Cycleway should be wider to add comfort
- Routing should be through areas of good passive surveillance to maximise feelings of social safety

Figure 2.9 Protected cycleway with signalled junction with dedicated cycle phase on West City Way.

Figure 2.10 Group of people cycling around a bus stop bypass on South West City Way.

Placemaking Active Travel Projects

Recent Active Travel Projects in Glasgow take the lessons learned from previous infrastructure and now introduce wider pedestrian and placemaking improvements alongside new active Travel Infrastructure.

South City Way demonstrates high quality active travel infrastructure on a bustling high street with revamped pedestrian plazas on filtered side streets. South City Way also hosts Scotland's first "Dutch-Style" junctions providing shortened pedestrian crossings across the carriageway and safe right turns for people cycling.

On Garscube Road pavements were resurfaced alongside new cycleways and new pedestrian crossings. Reducing vehicle space provided space for placemaking.

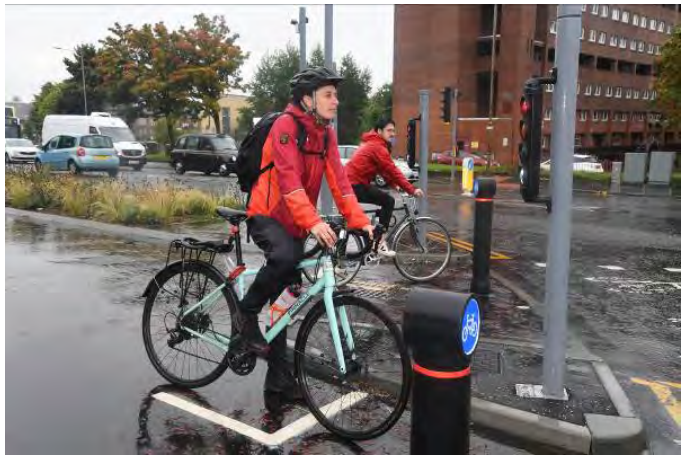


Figure 2.11: Two people in red jackets waiting at the cycle lights on Garscube Road.

Key elements introduced on these routes are:

- New surfacing within the cycle track
- Pavement and public realm revamp alongside with greenery and rain gardens
- Bus passengers provided with crossings between the bus stop island (bus boarder) and the main footway, across the cycle track
- Protected junctions which increase efficiency by managing pedestrian and cycle phases concurrently
- Integrated as part of a wider neighbourhood project: Connecting Woodside
- New pedestrian crossings installed as part of project

Figure 2.12: People pedalling off on Victoria Road cycleway after waiting at the cycle lights.

Sauchiehall Street demonstrates what can be delivered through higher spend and is our aspiration for all our high streets in Glasgow Network of Centres. Street trees, numerous benches, and high quality paving materials all contribute to creating a modern European boulevard in Glasgow's city centre.

Figure 2.13: Sauchiehall Street with someone in black walking in the foreground, in the background a parent is walking with their child who is cycling on the cycleway using stabilisers.

Sauchiehall Street is the pilot street for the Avenues programme which will be delivered across Glasgow's City Centre. The City Network will connect directly with the Avenues to enable simple active travel routes through Glasgow's City Centre.

Spaces for People

During the early stages of the Coronavirus pandemic Glasgow City Council introduced active travel projects to make it easier to get around by cycle and to provide more walking space. New routes on London Road and Royston Road, as examples, provided extensive protected cycle infrastructure. Lessons could be quickly learned with each subsequent delivery improving on the last. These lessons show the value in acting fast and learning lessons while being able to amend what is not working.

All projects above demonstrate what can be achieved and what Glasgow needs to roll out to enabling more people to make more active journeys. Each project provides significant lessons learned that can be incorporated into future projects to ensure that Glasgow's streets are working for all and enabling a range of activities.

Figure 2.14: Wooden plants on the road act to give more pedestrian space outside a school in Dennistoun.

Figure 2.15: Kelvin Way with sun filtering through the trees. Planters add extra greenery.

Figure 2.16: Cambridge Street with people cycling across a side street using the cycleway. were added to Cambridge Street alongside bolt down cycle infrastructure.

3

Design and Delivery Principles

3. Design and Delivery Principles

There has been an ongoing learning process through implementing new types of active travel infrastructure in Glasgow. The City Network sets out the change in approach to develop a connected route network across Glasgow rather than individual routes.

The Network in Place concept aims to build networks in specific geographical areas and then expanding to the whole city. 71% of 1175 respondents to the Active Travel Strategy Consultation agreed or strongly agreed with this approach. This will mean that initial roll out of the City Network will not have an equal geographical spread, but be focussed in areas with most potential to create networks quickly. Lessons can then be learned before wider roll out.

The Spaces for People (SfP) projects introduced light segregation of cycle infrastructure to provide a cost-effective solution for the provision of protected cycle lanes. While these cycle lanes have provided effective links, their interaction with points such as bus stops and at junctions can be improved for City Network roll out. To provide enhanced infrastructure this light segregation can be combined with permanent segregation at locations, such as bus stops and at junctions. This concept is called Spaces for People + and 63% of 1175 respondents agreed or strongly agreed with this approach in the Active Travel Strategy Consultation.

Figure 3.1: Remodelled junction on Garscube Road, road space has been reallocated to introduce greenery, a cycleway, and extended pedestrian plaza with benches.

Figure 3.2: two people use the cycleway on Garscube Road. The foreground shows a black bollard with blue cycle sign.

3.1 Cycling by Design

The Scottish guidance of Cycling by Design sets out the following twelve principles which will be followed in design and delivery.

1 We must plan and design for **mass cyclin**g by all kinds of people on different types of bike. Cycling infrastructure should no longer be something that we provide on the road network to only be used by the same people who are currently cycling. Instead it needs to be something that can be used by everyone.

2 Cycle users must be **protected from motor traffic** by physical separation or by significantly reducing the volume and speed of motor traffic on local neighbourhood streets. Additional space for protected facilities should be taken from the road carriageway and not from the footway.

3 Cycling infrastructure must be **fully accessible** by anyone who wants to use it, regardless of age, ability or experience. This means that gates or other access barriers which restrict the movement of many people, including those with disabilities, should not be included in design.

4 Cycle routes must form part of **fully connected networks** and be of a consistent quality throughout. We would not design a road network that 'abandoned' drivers or required them to get out and push their vehicle between routes. Cycling must be no different.

5 Cycles must be **treated as vehicles**. People cycling travel at different speeds from those walking and wheeling. In most circumstances these two user categories should be separated from each other.

6 Cycling takes **physical effort**. By minimising the number of times that cycle users have to stop, slow down and regain momentum, designers can provide more attractive facilities that encourage increased uptake of cycling.

7 Cycling infrastructure should be **intuitive for all who use it** or interact with it. It should be clear which space is allocated to different users, including pedestrians and motor vehicles, and how interactions are managed.

8 Cycling infrastructure should contribute positively to a **sense of place**. Along with other aspects of street design, it should attract people to use the infrastructure and spend time in the places that it is part of.

9 Design with maintenance in mind. Well-designed and constructed cycling infrastructure can be easily undermined if it becomes too difficult to maintain. This must be planned for at the earliest stage.

10 Creating safe cycling infrastructure can often be done quickly and economically by removing through-traffic from networks of local streets and safely connecting these networks. **Trialling these and other measures** on a temporary basis can help to test, monitor and improve the infrastructure and to gain public support.

11 **Designers should cycle** and experience each route they design to fully appreciate how the users of their infrastructure experience the network.

12 For these reasons, the design requirements of Cycling by Design 2021 are higher than they were previously. Exceptions may be needed where it would otherwise prevent the completion of a full cycle network, but these can only be applied when absolutely necessary and with due consideration of the level of service and Design Review processes set out in this document.

Glasgow City Council will follow Cycling by Design and other appropriate guidance. We will work with neighbouring local authorities, Scottish Government and third sector organisations to evaluate new designs and layouts to ensure we are at the forefront of best practice; going beyond established guidance where it is possible to do so. The principles below are brought together from range of guidance document to establish key principles for neighbourhood and walking design.

3.2 Residential Design Guide and Public Realm + Maintenance Guide

- Create an integrated permeable network of streets, footways, paths and spaces that are conveniently connected and offer choices of walking routes and create safe, welcoming environments.
- Provide for pedestrian desire lines which link to the surrounding network which should be well lit and over-looked to maximise feelings of social safety.
- Provide key walking links to any existing local communities, facilities, schools, shops, public transport, hospitals etc.
- Identify opportunities to create new walking links to neighbourhoods and destinations alongside City Network.
- The control of vehicle speeds and vehicle routing is crucial to the successful creation of a sense of place and inviting walking environments.
- Enable straightforward access to public transport.

3.3 Designing Streets: Scotland and CIHT Design for Walking

- Streets have important public realm functions beyond those related to motor traffic.
- Create dense pedestrian networks.
- Pedestrian environments should be protected from vehicle intrusion through design and enforcement.
- Pedestrian environments should be inclusive by design to be fully accessible with sufficient width, level and smooth surfaces, and well drained.
- Main roads should not create barriers and severance between neighbourhoods and communities.
- Take opportunity to reduce and better manage pavement clutter.
- Succesful places are distinctive, safe & pleasant, easy to move around, welcoming, adaptable, resource efficient.

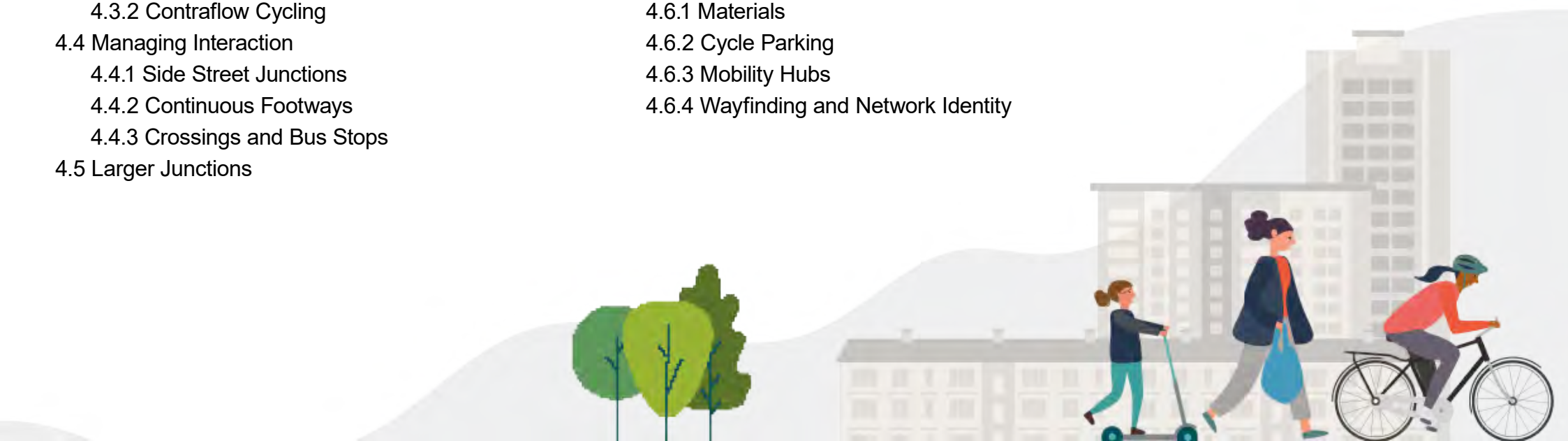
4

Design Outlines

4. Design Outlines

This section of the note sets out the general principals of the design interventions required to deliver the city network, setting out the delivery mechanisms through how they will be achieved such as Low Traffic Neighbourhoods and sustainable transport corridors. It also includes, case studies highlighting best practice and lessons learnt from elsewhere, highlights opportunities and constraints for measures in Glasgow and highlights specific design features that may be introduced to enhance sustainable travel and the public realm. The designs outlined in this document represent the envisioned style of delivery for the City Network. During delivery, designs will take into account on-the-ground context and a range of factors that mean designs need adapted to ensure a wide range of desired outcomes are achieved.

This section describes the following design features in turn:



4.1 Sustainable Transport Corridors

Introduction to the Concept

Sustainable Transport Corridor is a general term for routes where public transport and active travel modes are prioritised over non-sustainable modes. Prioritisation can take place through the provision of space (e.g. bus or cycle lanes), signal prioritisation, or through timed restrictions on general through traffic.

The development of Sustainable Transport Corridors in Glasgow aims to deliver significant bus journey improvement and introduce high quality active travel infrastructure. Bus is vital for the functioning of Glasgow as a city and the Bus Partnership is the mechanism to deliver for this key transport mode. Some of these routes could also host lines of the Metro+ project in future years.

The corridors will need to provide a cohesive route from end to end for public transport and active travel while enhancing the public realm environment in any high streets. They should form the basis of enabling residents to reduce the usage and ownership of private cars by creating safe and convenient alternatives.

Figure 4.1: Street scene from Netherlands with blue and white tram running through a busy town square and someone cycling beside the tram.

Case Studies

Blackfriars Road / Farringdon Street – London

Central London has seen the introduction of a series of segregated cycle routes, linking inner city locations to central London. These routes tend to be along busy bus routes, therefore when reallocating carriageway space to provide cycle lanes, additional mitigation was required to prevent bus delays. The images below show a section of Cycle Superhighway 6 on Farringdon Street in Central London. The section required the removal of kerbside parking and the respacing (and minor reduction in number) of bus stops to ensure that there was no increase in bus delays when due to the introduction of the segregated cycle lanes.

- Changes in kerbside provision required (parking, loading and bus stops)
- Approx. 30 buses per hour in each direction
- Up to 8,000 cycles per day
- Public realm benefits

Figure 4.2: Old layout of Blackfriars Road in London with multiple vehicle lanes and long pedestrian crossings.

Figure 4.3: remodelled Blackfriars Road in London with improved footways and a new cycleway.

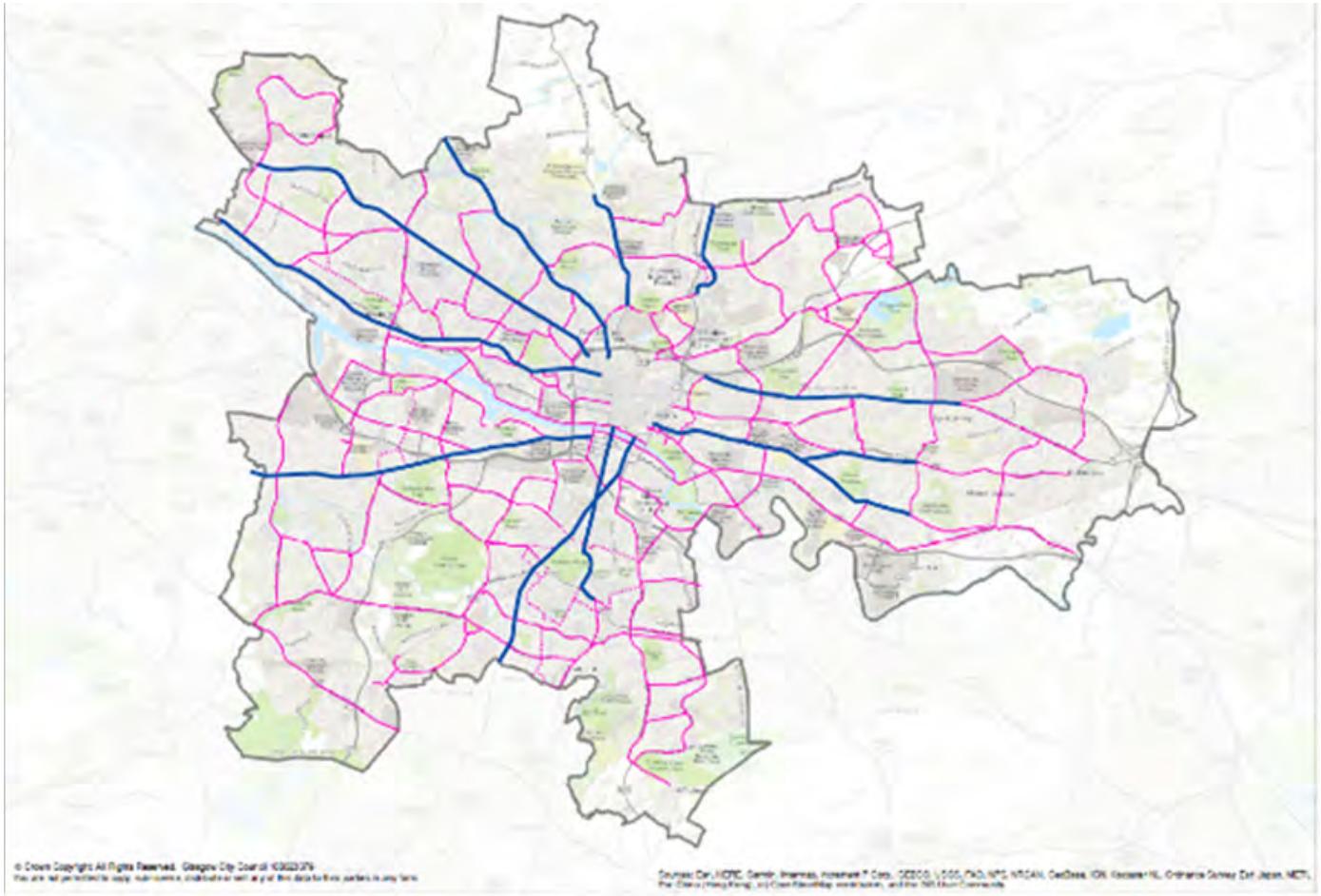


Figure 4.4: Map of proposed City Network with nine high frequency bus route highlighted.

Opportunities and Challenges

This section of the note sets out a few examples of sections of the proposed sustainable transport corridors that offer opportunities and challenges for delivery of active travel, public transport routes and the public realm.

Great Western Road

This is an example of a section of a corridor where there is an opportunity to provide both high quality bus priority and active travel measures. The key features of the section highlighted in the photograph below are:

- A wide section of public highway with excess existing carriageway space
- A central grass verge
- A street where the movement function is much higher than its place function
- Low existing bus frequency (<10 at peak hours)

Figure 4.5: Great Western Road with bus lane in foreground and wide green space separating carriageways.

Potential measures that could be considered in this section are:

- Bus lanes
- Segregated cycle lanes
- Bus stop bypasses
- Soft landscaping (planting) / SUDs features

Maryhill Road

This is an example of a section of a corridor where there is a bottleneck. The key features of the section highlighted in the photograph below are:

- Wide carriageway on the approach to and exit from the bridge
- Carriageway under the bridge restricted to one narrow lane in each direction
- Narrow footways and no existing provision for cycles
- Approximately 20 buses per hour at peak hours

Figure 4.6: High up view of Maryhill Road with blue bus.

Areas like this are not barriers to delivery but engineering challenges that will need to be overcome. However, these areas also provide opportunities to change the traffic network in the area. Measures that could be considered here are:

- Filtered permeability (restricting certain modes – such as private cars, to ensure that sustainable transport modes have priority)
- Time managed restrictions – closures to certain vehicle types during different parts of the day, e.g. private cars during the morning peak period to promote the use for sustainable transport for commuting trips

If measures such as those noted above are introduced to further restrict traffic flow through the existing bottlenecks it will open up opportunities to reallocate carriageway space to sustainable transport modes further along the corridor. The image below shows a location where if traffic flows were to reduce additional measures such as bus lanes, cycle lanes or other bus priority measures may be achievable without causing significant local congestion.

Figure 4.7: Width constriction due to aquaduct crossing over Maryhill Road.

Kilmarnock Road (A77)

This is an example of a section of a corridor where congestion at a junction creates a bottleneck along the corridor. Along the corridor on street parking dominates the streetscape with parking overspill into bus stops. The key features of the section are:

- Wide junction
- Recent improvements to crossing and footway materials
- 20+ buses at peak hour

The scale of the junction creates a barrier for active travel. Measures to reduce the size of the junction should be considered, this could be achieved through restricting vehicle movements by prioritising the main routes and building out footways. This may result in a reduction in traffic capacity but the space available at junctions such as this presents an opportunity for a step change improvement in the quality of the public realm and provision for active travel.

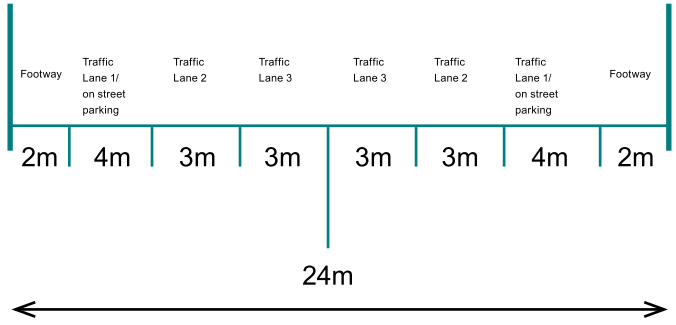
Design Requirements

The ideal choice is to provide wide footways containing soft landscaping features, wide segregated cycle lanes, bus lanes and general traffic lanes (as shown below).

Where there is less space available along a route, compromises will be needed. It may be that fully segregated cycle lanes aren't achievable or that bus lanes cannot be provided. However, the routes must prioritise sustainable transport over other modes. Options of how to incorporate measures that enhance sustainable transport modes within road types of various widths are shown within the cross-sections below.

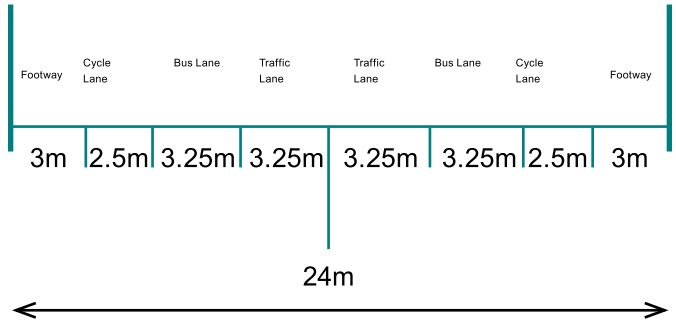
Layout 1 – existing

This shows a wide street that is currently dominated by motor vehicles, with 20m of the 24m width of public highway occupied by carriageway space with no dedicated cycling provision.



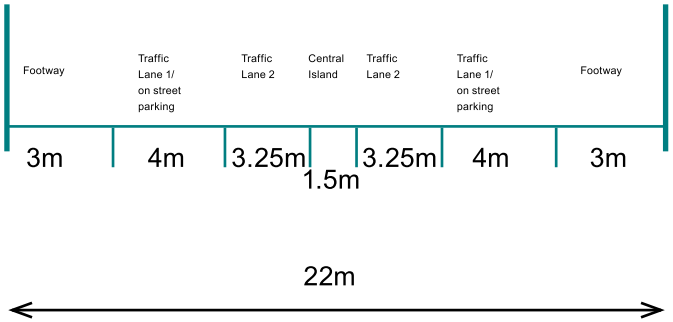
Layout 1 – Proposed

This layout shows an option where the existing space for private motor vehicles is reduced from 3 lanes in each direction to 1. That space is then reallocated to provide a bus lane and a cycle lane in each direction and widen the footways by a metre. Any parking along the corridor would need to be removed or relocated to wider sections of the corridor or on to side streets.



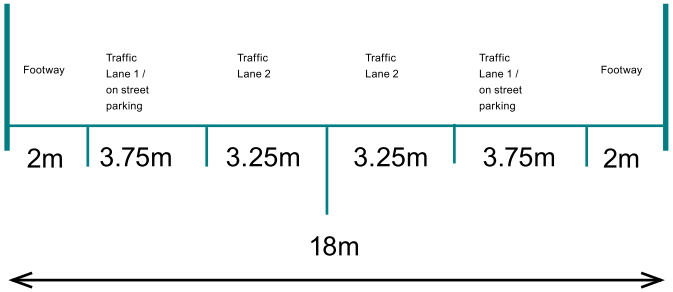
Layout 2 – existing

This shows a slightly narrower street at 22m wide, that is also dominated by motor vehicles but has wider footways and a central traffic island.



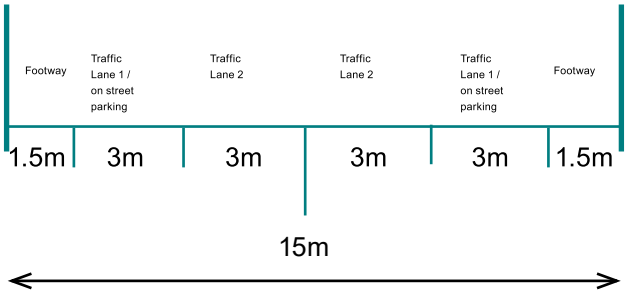
Layout 3 – existing

This shows a narrower street at 18m wide. 14m of the 18m is allocated to motor traffic with narrow footways of 2m on either side.



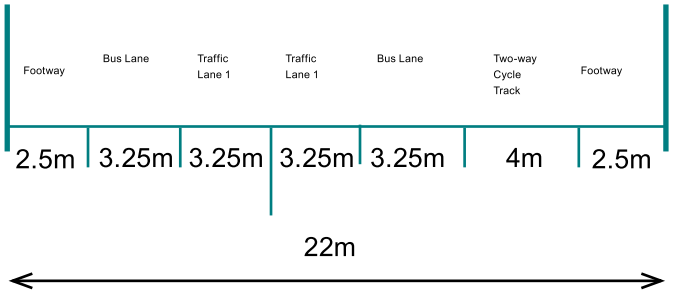
Layout 4– existing

This shows an example of a narrow street at 15m wide. 12m of the 15m is allocated to motor traffic with narrow footways of only 1.5m on either side.



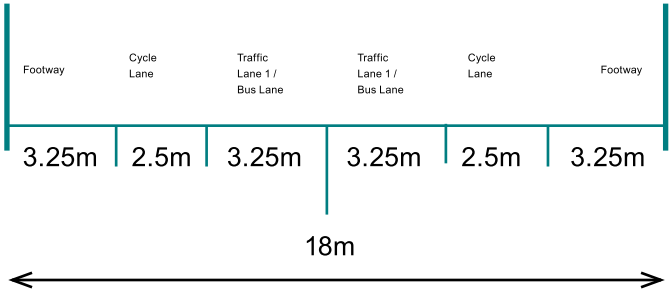
Layout 2 – Proposed

This layout shows an option where a compromise may be required to achieve the aims of promoting sustainable transport modes. The option below could be considered where pedestrian flows are relatively low, so the footway width could be reduced slightly to allow for the provision of a cycle track (in this case a two-way track to limit the overall space requirement). The provision of the bus lanes would require any on-street parking to be removed or relocated.



Layout 3 – Proposed

This layout shows that in narrower streets to be able to introduce high quality cycle lanes a compromise will need to be made to either remove general traffic (by providing bus lanes only) or removing the requirement for bus lanes in certain narrow sections of the corridor. This would allow for the footways to be widened too.

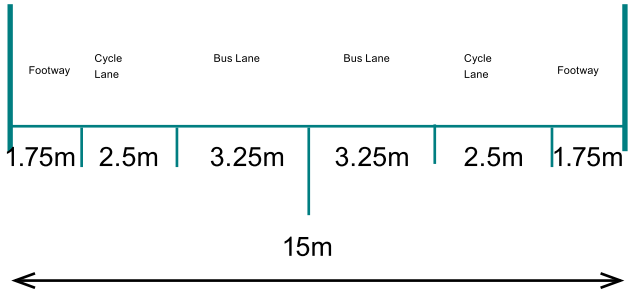


Layout 4 – Proposed

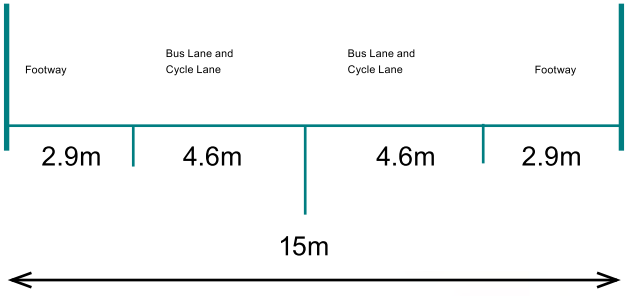
Two layouts are shown for this layout as at this width the choices on how to distribute the limited space available becomes even more challenging. Neither option includes the provision for private motor vehicles, however, limited provision could be made for access without significantly reducing the priority for sustainable modes. Consideration on how to achieve this would need to be made at a network level.

Option 1 shows a layout that could be provided where pedestrian flows are low and there are limited commercial frontages along this section of the corridor. Accordingly, the additional space gained from removing general traffic is allocated primarily to the cycle lanes.

Layout 4 – option 1:



Option 2 shows a layout where additional footway space is required to enhance the environment for pedestrians (and bus passengers at stops). The consequence of this is that buses and cyclists will be required to share the same lane. A 4.6m wide lane would allow buses to pass cyclists (and vice versa when buses are at stops) but would be a compromised on the level of provision for cyclists so alternative higher quality provision would be required on a nearby parallel route to enable the network to provide the quality of provision required.



Layout 4 – option 2:

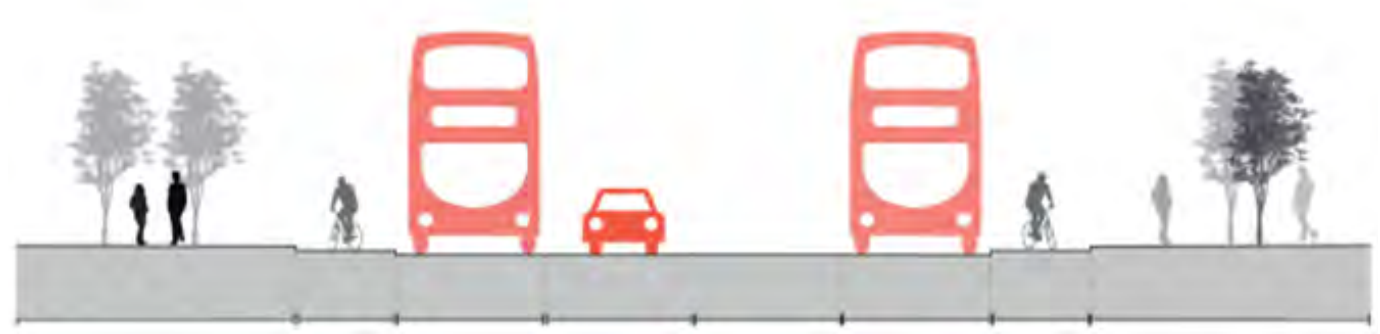


Figure 4.8: Generic example cross section of a wide street catering to different transport modes.

The above cross-sections show some of the potential options available to reallocate space to prioritise sustainable transport modes along the corridors. Design features that enable that prioritisation are shown in the following pages of this note. However, this is not an exhaustive list of measures, additional measures are welcomed provided that they contribute positively to sustainable transport and the quality of the public realm.

4.2 Spaces for People+

Introduction to the Concept

The implementation of Spaces for People (SfP) in Glasgow during 2020-2021 demonstrated light segregation cycle infrastructure enabling quick and cost effective delivery of protected cycle links. However, the temporary nature of the materials and pressures of working during the earlier stages of the COVID-19 Pandemic meant that a number of lessons were learned that can be taken forward to improve delivery and design in the future.

The Spaces for People+ concept aims to build on lessons learned during the original Spaces for People roll out by combining simple bolt down materials of higher standard with permanent high quality finishes at areas of interaction. These areas of interaction are when different transport modes (walking, cycling, driving, public transport) will interact with each other. Junctions, crossings, and bus stops are the most common examples of these areas of interaction.

The above example is well designed with bolt down materials providing visual priority for straight ahead cycling over turning motor traffic. In future Spaces for People+ roll out of the City Network then this situation would be dealt with be high quality permanent implementation.

It should be noted that Spaces for People implementation was during an uncertain time in the early stages of the pandemic. where it was not clear the risks posed by any in person contact even outside. The Spaces for People+ concept would be subject to a robust but efficient consultation period to ensure the best possible delivery is achieved.

Figure 4.9: People using protected cycle space introduced on Clyde Street as part of Spaces for People.

Figure 4.10: Group of people cycling across side street on cycleway on Cambridge Street, red van is waiting to turn and bus in background.

Figure 4.11: Mother walks child cycling along Cambridge Street cycleway. space to walk and cycle.

Figure 4.12: George Square with space allocated away from parking to pedestrian space and light grey planters.

Figure 4.13: Kelvin Way with groups of people walking down the traffic free spaces.

Bus Stops

Cycleway and bus stop design has evolved over time, but the main aims are to promote positive interaction between those cycling and those using the bus. Generally this is achieved by ensuring that people have sufficient space and sight lines to manage that interaction and that design emphasises priority for those walking to access the bus or bus stop.

Some designs result in the cycleway stopping and resuming at the bus stop (see below). This has a number of disadvantages for the bus user if the bus is delayed pulling in during high cycle flow periods and increases mental load on the driver as must ensure they are pulling in safely. For people cycling it also means that they must wait for boarding/alighting to be complete or overtake by mixing with general traffic, which creates a situation where the cycle network does not become suitable for an unaccompanied

Figure 4.14: Spaces for People cycle provision in Edinburgh with bolt down bollards to protect the cycleway.

Some SfP routes managed interaction by building out the bus stops with the advantage that the bus no longer needs to pull into the bus stop, however this creates the situation where bus users and those cycling need to interact. Design attempts to promote safe, reasonable interaction at these locations.

Where space was available larger build outs enabled zebras to be painted to visually promote pedestrian priority during boarding/alighting. The steep ramp up was intended to slow people cycling and allow level access to the bus, however initial implementation led to ramps that were too steep resulting in difficulty controlling a cycle even at slow speeds, along with the build up of detritus around the bus stop, and drainage issues. These issues resulted in many people cycling rejoining the traffic lane at these points, negating the intended safety enhancements.

An example from Manchester showing different options to the above example from Great Western Road. In the Manchester example the bus stop island itself is not ramped creating a clear bus user space. However the bus users must ramp down then ramp up to access the bus with no zebra giving visual priority.

Figure 4.15: Great Western Road with space for people cycleway showing bus stop build out.

Figure 4.16: Bus stop island in Manchester with separated people boarding and alighting the bus from those cycling.

4.3 Neighbourhood Network

4.3.1 Low Traffic Neighbourhoods

Introduction to the Concept

Low Traffic Neighbourhoods is a general term for when traffic circulation is rethought at a neighbourhood level. The aim is that through-traffic is confined to the main road network which is designed to accommodate such traffic volumes. The result is that streets which have a primary access function no longer take through-motor traffic which significantly lowers traffic volumes, creating a safer more pleasant walking and cycling environment.

Low Traffic Neighbourhoods are a vital first step for lowering traffic levels city-wide. By constraining through traffic on the main road network it is more straightforward to manage demand and pedestrian crossings can be targeted on these main roads.

Low Traffic Neighbourhoods can create significant benefits to people and society if carefully implemented. Such benefits are:

- Significantly lowered traffic levels within the low traffic neighbourhood
- Increasing walking and cycling levels[8]
- Improved road safety[9]
- Lowering levels of car ownership and use[10]
- Reduced crime[11]

The above evidence largely comes from recent roll outs of Low Traffic Neighbourhoods in London Boroughs and provides a strong evidence base, and lessons learned. Some low traffic neighbourhoods found increased traffic levels on boundary roads, some experienced less traffic in surrounding roads, but the key lesson was for sufficient monitoring within and outwith the low traffic neighbourhood over a trial implementation period.

The Pave the Way report from Transport for All is recommended to better understand impacts of low traffic neighbourhood for disabled people.

No overall impact on fire service response time[12] was found with the recent roll out in London. Some responses times were found to have likely increased due to presence of low traffic neighbourhoods, but other response times were reduced. It is possible to use implementation design that allows emergency services through a low traffic neighbourhood and can be used as an option where risk to response times is identified. In fact, Glasgow is full of such “Fire Paths” which have been in place for several decades.

8. Department for Transport Low Traffic Neighbourhoods Residents’ Survey
9. Laverty, A.A., Aldred, R. and Goodman, A., 2021. The Impact of Introducing Low Traffic Neighbourhoods on Road Traffic Injuries. Findings, p.18330.
10. Aldred, R. and Goodman, A., 2020. Low traffic Neighbourhoods, car use, and active travel: evidence from the people and places survey of outer London active travel interventions. Transport Findings.
11. Goodman, A. and Aldred, R., 2021. The Impact of Introducing a Low Traffic Neighbourhood on Street Crime, in Waltham Forest, London. Findings, p.19414.
12. Goodman, A., Laverty, A.A., Thomas, A. and Aldred, R., 2021. The Impact of 2020 Low Traffic Neighbourhoods on Fire Service Emergency Response Times, in London, UK. Findings, p.23568.

Glasgow's Existing Low Traffic Neighbourhoods

Such neighbourhood traffic circulation concepts are not new to Glasgow and many examples exist across the city. Some of these low traffic neighbourhoods were designed as the neighbourhood was built and others were retrofitted to existing neighbourhoods. The map in *Figure 4.16* shows the low traffic neighbourhoods already in existence across Glasgow.

The example shown in *Figure 4.18* is from a neighbourhood in Govan where the boundary roads of Govan Road, Golspie Street, Harmony Row, and Crossloan Road contain a low traffic neighbourhood.

It is not possible to drive through the access only streets, however, it is possible to walk or cycle through them. Properties are still accessible by motor vehicles and serviced by the council's refuse vehicles etc. The colours in the example below denote "neighbourhood traffic circulation zones" with the entry and exits marked by arrows.

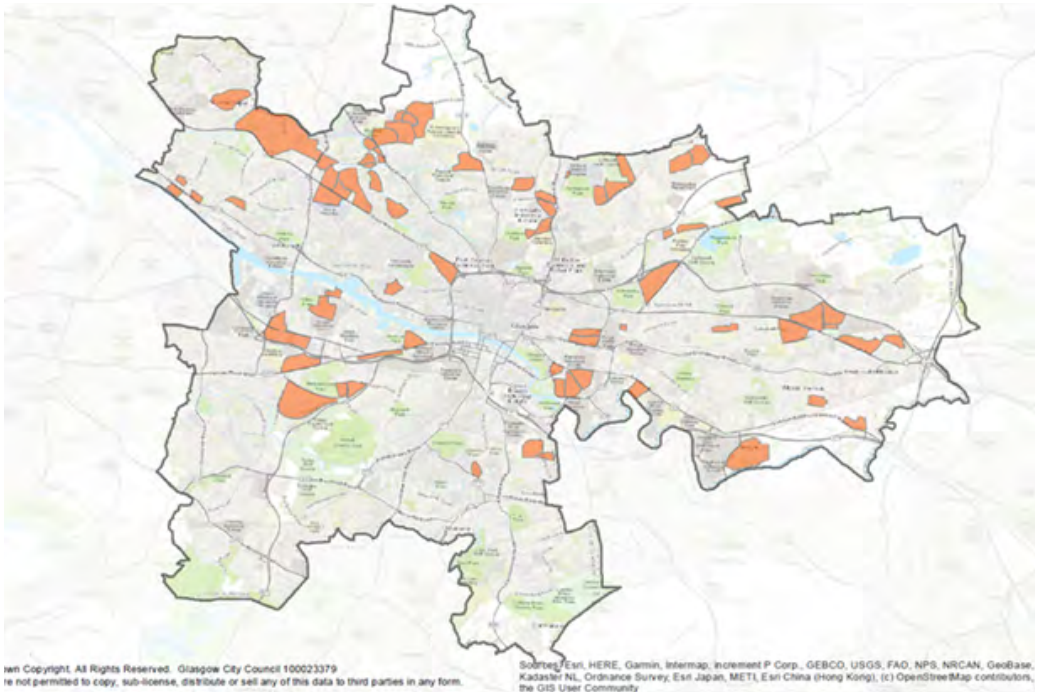


Figure 4.17: Map of Glasgow showing existing low traffic neighbourhoods in orange.

Figure 4.18: Detailed outline of existing low traffic neighbourhood in Govan. Colours showing different traffic access zones.

Case Studies

Recent implementation of low traffic neighbourhoods can be seen in London where several programmes have been rolled out across the city, including the Walthamstow Village scheme. A review[13] of the scheme revealed that 11 out of the 14 roads within the Village area saw significant reductions in the number of recorded vehicles before and after the introduction of the scheme. The average road within the Village was noted to have a 44.1% reduction in daily traffic counts a year after implementation.

Conversely, there was an increase in traffic volume recorded on the three surrounding boundary roads. This was 4% on Hoe Street, 11% on Lea Bridge Road and a bigger increase of 28% on Shernhall Street. However, on Shernhall Street, despite the overall increase in vehicle numbers, an hourly breakdown of the data revealed that the two large peaks in traffic movements observed pre- scheme reduced from 902 vehicles per hour to 663 vehicle per hour.

Other notable statics from the Walthamstow Village review revealed the following:

- Average vehicle speeds decreased throughout the area, both in the mean speeds and 85%ile speed. The average 85% percentile speed reduced from 21.6mph to 19.5mph.
- Likewise, both the 85th percentile and mean vehicle speeds on the surrounding roads reduced.
- Within the Village there were 15 slight collisions recorded over the three years pre-scheme with an average of five per annum. There were no collisions recorded within the Village area in the 11 months following its implementation.
- The overall number of collisions on the boundary roads has stayed consistent pre and post scheme.
- Bus journey times have increased slightly on the routes analysed. However, most of the fluctuations in journey time were less than one minute.
- Junction assessment using London Cycling Design Standards (LCDS) methodology found that all tested junctions in the area scored better than before the scheme. This was attributed to improvements to cycle safety at junctions, as well as significant decreases in traffic volume and 85th percentile speeds.

13. Enjoy Waltham Forest., 2017. Walthamstow Village Review.

Treatment Measures on the edges of Low Traffic Neighbourhoods

To help reduce vehicle speeds and to create a recognisable entry/exit feature, continuous footways **should** be the default treatment at junction points in/out of Low Traffic Neighbourhood areas. The criteria for continuous footways have been provided within Section 4.4.2.

Communication within a proposed low traffic neighbourhood and the surrounding area is vital to get right. People need support to understand why the changes are being made and how this might impact their journeys, whether that is their own driving or being picked up by taxi as well as other vehicular access to homes.

Figure 4.18 shows some examples of pamphlets which communicate the changes to residents. The aim is to be simple and clear with the communications.

The changes to streets also need to be communicated to sat-nav and mapping companies so that drivers are not erroneously routed through a neighbourhood. However, even when informed navigation apps etc don't always update. Some London Boroughs have had success with resourcing teams on the ground for the first week to help people navigate and understand changes.

It is also important to communicate the ongoing monitoring of the scheme. If changes can be measured, they need enough lead in time to be able to confidently show change from the implementation of the Low Traffic Neighbourhood.

Reserve Resources

Experience from London suggest a low traffic neighbourhood programme needs significant resource in reserve. One reason is to ensure filters can be removed, moved, or adjusted, if necessary, in response to data or specific feedback in the area. Another reason is that many filters have been the target of vandalism and needed to be repaired or replaced. It should be noted that this vandalism was directed as a result of the street changes and was not random.

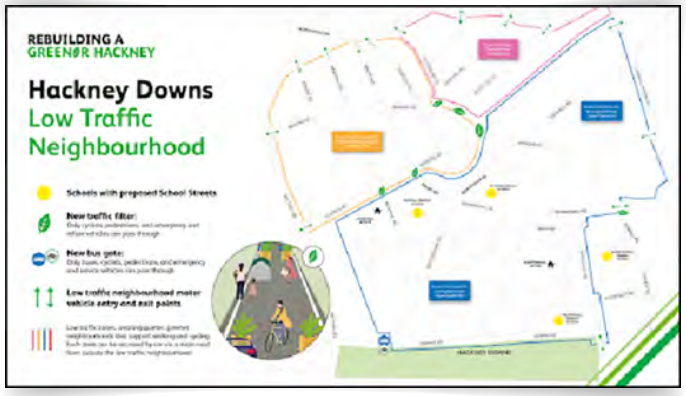


Figure 4.19: Examples of two pamphlets produced in London to communicate low traffic neighbourhoods.

Design Requirements

There are several measures which can be implemented to help create a Low Traffic Neighbourhood, ensuring that there are no direct through routes for motorised vehicles but still allowing access to all homes and providing new public space.

There should be no standardised approach when implementing these interventions and the engineering design should be flexible. The type of treatment measure and its location must be determined and refined in partnership with key stakeholders, including local community groups and emergency services.

As an example of difference in implementation, the low traffic neighbourhood in Govan shown in Figures 4.20 and 4.21 has modal filters in the middle of the neighbourhood. Woodlands, on the other hand, has the filters along Great Western Road which creates a 550m long contiguous pedestrian high street zone; possibly the longest in Scotland.

Examples of the main treatment measures for Low Traffic Neighbourhoods are provided below:

Modal filters

This can be using a simple bollard or planter through which people can travel by walking or cycling, but not by motorised vehicle. This treatment will provide additional value when located at the most common entry/exit points of the neighbourhood for people walking and cycling.

Figure 4.22 below is an example of filtered permeability on the Quietway 2 cycle route along Northchurch Road in Hackney, London. Before the installation of the bollards and designated lane entry points, the clarity of the entry points was minimised due to the lack of red coloured surface material highlighting the cycle lanes and filter. In addition, there was no designated pedestrian crossing feature. The implemented treatment was chosen due to its clear indication of filtering to all road users and pedestrians while also enabling accessible crossing for pedestrians. The visibility of the cycling lanes within the filter compliant with the London Cycling Design Standards allows the cyclist and other road users to identify the filter more easily while the bollards offer a restrictive treatment to vehicles and therefore, minimise the risk of collisions with cyclists and pedestrians within the filter junction.

Before

Figure 4.20: Example of a side street modal filter in London where people can walk or cycle across but not drive.

After

Figure 4.21:Example of side street modal filer in London which has designated cycleway.

Figure 4.22: Person cycling through the modal filter wearing but giving way to a bus.

Pocket parks

Pocket parks like modal filters can also be used to provide a visually enhanced entry/exit for active travel. This section does not cover the wider design or implementation of pocket parklets, only their introduction as modal filters.

These are two sets of filters, spaced slightly apart to create a new area through which people can only travel by walking or cycling.

Figures below is a pocket park situated on Whitney Road in Waltham Forest, London. Originally a road for vehicles, the implementation of the pocket park improves interconnectivity across the Waltham Forest Borough while enabling greater inclusivity to the green spaces. In addition to restricting road vehicle access, the paired filtering treatment creates an additional public green space that is connected by cycling and pedestrian infrastructure.

Before

Figure 4.23: Before image of side street junction in London.

After

Figure 4.24: After image of side street junction after new light colour paving greenery and cycle hoops have been added.

Diagonal filters

These are bollards or planters positioned diagonally through a crossroad junction minimising the need for reversing, facilitating refuse collection or other large vehicle movements.

Figures below shows an image of the diagonal filter at the junction between Capworth Street and Vicarage Road in London. Originally a busy crossroad with two-way transit on Capworth Street and a one-way on Vicarage Road, both roads have been arced and connected by a diagonal filter allowing two-way cyclist movements between the streets while there is one-directional vehicular flow along both streets. The implementation of the diagonal filter mostly enables a minimisation of large-vehicle movements which in turn, provides a safer environment for pedestrians and cyclists.

Before

Figure 4.25: Before image of aerial view of typical residential cross roads.

After

Figure 4.26: after image of aerial view after a modal filter has been added to cross section.

Figure 4.27: Ground view of the new modal filter from figure 4.26.

Bus Gates

This refers to a modal filter, through which buses can pass through and don't require rerouting, while restricting access to other motorised vehicle access. This can often be achieved via triggered rising bollards or Automatic Number Plate Recognition (ANPR) cameras. Rising bollards can incur maintenance costs, but experience from London suggests there can still be significant through traffic with only ANPR.

Figure 4.27 below is the Bus Gate on Oxford Road in Manchester. Originally a road for all vehicle types, the implementation of a bus gate reduces the congestion of vehicles and provides more efficient public transport routes. The minimisation of congestion enables the safer transportation of cyclists throughout the bus gate network through reduced car and motorcycle traffic.

Figure 4.28: Bus gate in Manchester signs in foreground show time of operations and provide information that taxis and permit holders are exempt.

School Streets

These are time-limited filters based on or around streets with schools on them. Signs are often used to highlight the restrictions to motorised vehicles, however, bollards may be raised or lowered for a period of time around school start and end by school staff. These restrictions prevent through traffic and parents dropping off close to schools and consequentially reduce levels of traffic and pollution in the immediate vicinity of schools during these times, and encourage active forms of travel to and from school

Transport for London has published survey results[14] which suggests that interventions outside schools to make walking and cycling safer are popular with parents and carers and have contributed to a drop in car use. Parents and carers from 35 schools took part in the study and the results showed:

- 81% of those surveyed at schools where measures had been implemented believed a School Street is suitable for their school
- 73% of parents and carers at these schools agree with School Street measures remaining in place while social distancing is still required, with 77% supporting the changes being kept in the long term subject to consultation
- Two thirds (66%) of parents and carers at schools without School Street measures support their implementation while social distancing is still required and a majority of these parents (59%) also support such measures in the long term subject to community engagement and consultation
- Since the pandemic, parents and carers reported walking to school more, and driving less, at both School Street schools and those without School Streets
- At schools with School Streets, parents and carers reported driving to school less as a result of both the coronavirus pandemic and the School Street. The School Street had a greater impact (-18%) on reducing car travel to school compared to the impact of coronavirus (-12%).

A further study published in March 2021[15] found that closing roads around schools to traffic at pick-up and drop-off times has reduced polluting nitrogen dioxide levels by up to 23%.

Figure 4.29 is one of the active School Streets within the Merton Healthy Streets initiative in London. The implementation of temporary bollards incentivises parents, carers and school children to walk, scoot or cycle to school. The measure provides a safer commute to and from school while also encouraging active travel and reduced environmental impact

Figure 4.29: School street closed to traffic during school pick up and drop off times, families are walking casually in the carriageway with plenty of space.

14. School Streets – Interventions Sites vs. Control Sites, January 2021, Transport for London
15. Air Quality Monitoring Study: London School Streets, March 2021, Greater London Authority, FIA Foundation and Bloomberg Philanthropies

4.3.2 Contraflow Cycling

Introduction to the Concept

Contraflow cycling provides people cycling with the ability to travel in both directions on a street that has been designated one-way for private motor vehicles. It increases the permeability of the cycle network, leading to shorter journey times, significantly increases the resilience and capacity of the cycling network, and enhances the attractiveness of cycling as an alternative to driving.

Glasgow residential tenement streets should be assumed to be able to accommodate contraflow cycling if they are converted from two-way to one-way for general motor traffic.

Case Studies

One-way roads had the largest effect on reducing collision risk along with the provision of priority junctions **- Collins, D. and Graham, D. (2019) "Use of Open Data to Assess Cyclist Safety in London",** ***Transportation Research Record: Journal of the Transportation Research Board*****, 2673(4), pp. 27-35. Doi: 10.1177/0361198119837221.**

"A study on contraflow cycling in Brussels showed that, during the investigated period, the risk for cyclists to have a collision was four times higher at primary network roads and intersections than on the local network, where the vast majority (91%) of the contraflow cycling streets are located. The study also found that nearly half (47.8%) of all cycling collisions occurred at intersections. The results furthermore showed that only 126 out of 922 (12.7%) collisions involving cyclists occurred on roads where contraflow cycling is allowed." & "The results from the study on contraflow cycling in Brussels showed that for the collisions involving cyclists that occurred on roads with contraflow cycling, only 47 of those collisions involved a cyclist travelling against the flow of traffic (37%), while 79 involved cyclists riding with the flow (63%)." **- BIVV-IBSR (2014) Safety aspects of contraflow cycling. Detailed analysis of accidents involving cyclists on cyclist contraflows in the Brussels-Capital Region (2008, 2009 and 2010).**

"Research from Germany, France and Belgium shows that a significant amount of collisions involving contraflow cyclists occur at intersections. Of the 47 collisions in Brussels involving contraflow cyclists, 31 collisions (66%) occurred at an intersection." In addition to this, 6 of the 47 collisions occurred with collision with parked vehicle.

"The collisions at Brussels' intersections were caused by failure to give way, poor positioning at the intersection, and a turning vehicle that cut across the path of the cyclist. In Germany, over 70% of the collisions involving contraflow cyclists at intersections occurred due to a vehicle failing to give way and turning into or cutting across the road." **- German Insurance Association (2016) Cycling roads and one-way streets with contra-flow cycling. Compact accident research**[16]

16. Briefing-Contraflow-Cycling.pdf (etsc.eu)

Design Requirements

By default, designers **must** incorporate contraflow cycling provision into any proposals associated with one-way streets.

There are various types of contraflow arrangements which can cater for cycle traffic; however, the level of provision is dependent on a number of site-specific factors such as available road width, traffic volumes, speeds and proximity of parking or loading areas. In some instances, unfavourable site conditions within the street, such as untreated gyratories, may mean there is no suitable treatment therefore no contraflow cycling facilities are proposed.

Details of the varying levels of contraflow provision and guidance on the selection of the most appropriate type are provided below:

Mandatory Cycle Lane Contraflow

Mandatory cycle lanes are generally delineated by a solid white line which signifies the exclusion of other types of vehicles entering unless crossing the lane to a driveway, access or parking/loading bay. Where contraflow cycling is enabled by a cycle lane, it should have:

- Desirable minimum cycle lane width of 2m
- Absolute minimum cycle lane width of 1.5m
- Width of opposing traffic lane should be between 2.6m and 3.2m.

Advisory Lane Contraflow

Advisory cycle lanes demarcate an area of the carriageway by using a broken white line which instructs motor vehicles not to enter unless unavoidable.

- Where the 85th percentile speed is below 25mph or traffic flows are below 1,000 veh AADT.
- Desirable minimum cycle lane width of 2m
- Absolute minimum cycle lane width of 1.5m
- Width of opposing traffic lane should be between 2.6m and 3.2m

Figure 4.30: Contraflow cycle lane with island separator to better protect people cycling at the junctions.

Figure 4.31: Advisory contraflow cycle lane running down residential street.

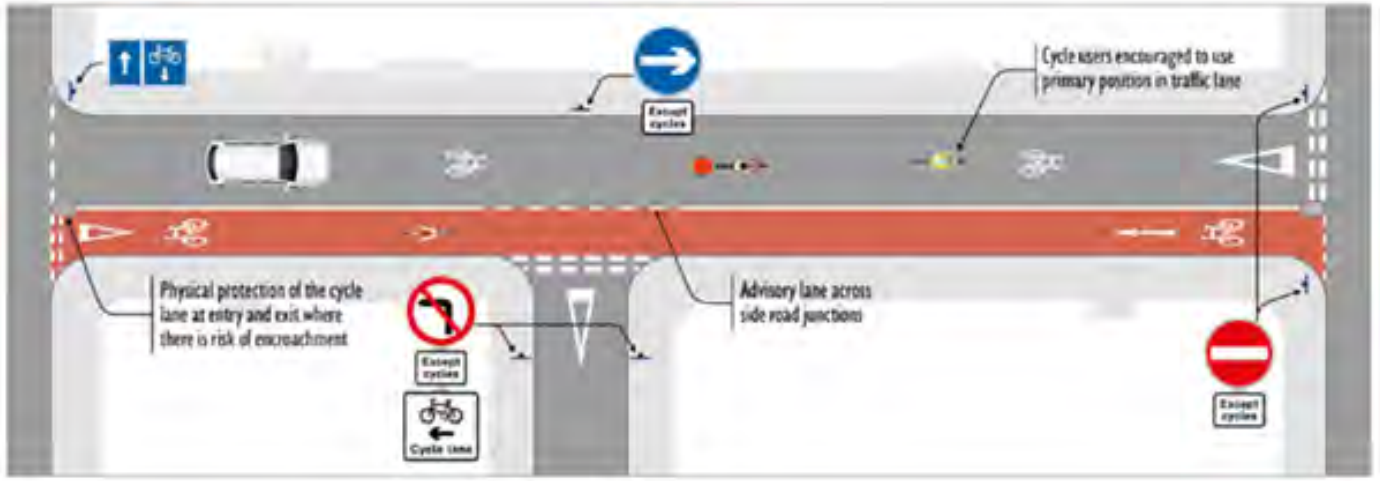


Figure 4.32: Schematic image showing general layout of contraflow cycling lane.

Unsegregated Contraflow

Unsegregated contraflow systems are appropriate for filtered neighbourhood streets which have had one-way systems added. These work particularly well for the wider cycle network as this allows people to choose routes through neighbourhoods away from the main road network. They also allow much shorter connections between any main road cycle network and people's homes and destinations.

- Where the 85th percentile speed is below 25mph and traffic flows are below 1,000 veh AADT.
- Absolute Minimum Carriageway Widths:
  - 2.6m with no car parking
  - 3.9m based on a car passing cycle, no car parking
  - 4.6m including allowance for car parking on one side of the road
  - 6.6m including allowance for car parking on both sides of the road

Figure 4.33: Esmond Street in Yorkhill in Glasgow which has contraflow cycling with no marked lane.

Figure 4.34: Carfrae Street in Yorkhill in Glasgow which has contraflow cycling with no marked lane.

It should be noted that, if the minimum carriageway widths cannot be achieved, a site-specific assessment should be undertaken to consider the appropriateness of introducing contraflow cycling, taking cognisance of elements such as road geometry, visibility, parked cars and volume of vehicles. The results of the assessment should be passed to Glasgow City Council for confirmation of acceptance prior to any proposals being formalised.

Other Selection/Design Considerations

Other factors when considering the various levels of contraflow cycling provision are road geometry visibility and parking/loading areas.

The potential for motorised vehicles to park, load or unload, where possible, **should** be removed from the contraflow side of the carriageway to remove the risk of conflict between parked cars and people using the contraflow provision. It also increases the visibility and awareness of the contraflow arrangement for pedestrians. However, if parking cannot be removed and carriageway widths are restricted, then consideration **should** be given to a break in parking provision at regular intervals to allow road users sufficient space to pass one another.

Additional Width Requirements

If the contraflow cycling provision is located adjacent to fixed objects or parking/loading bays additional width **must** be allowed for. Refer to table 3.9 within Cycling by Design for additional space to fixed objects requirements. For cycle lanes located next to parked cars or loading bays a safety strip of 1m (desirable minimum)/0.5m (absolute minimum) **must** be provided.

Where circumstances allow, segregation for cyclists at the entry to and exit from the one-way street **should** be provided. This will highlight the presence of cyclists and can improve their safety. However, the design of such segregation **must** ensure the cycle provision is unobstructed by parked vehicles.

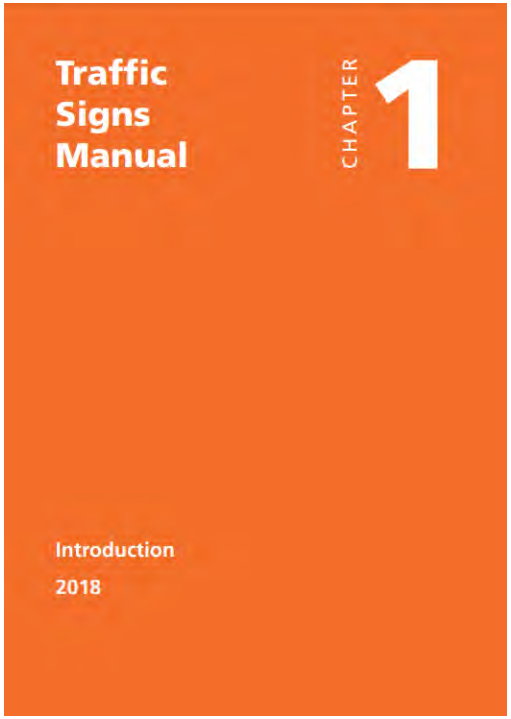
Entry/Exit and Side Street Junction Treatments

In instances where contraflow cycle lane markings are not present (unsegregated contraflow provision), a short section of advisory lane markings **should** be considered at entry/exit points and also where side roads connect to the contraflow. This, and the introduction of coloured surfacing at these locations, can help make people walking and motorists more aware of the possibility of cyclists travelling in contraflow.

However, in instances where continuous footways form the entry/exit treatment, road markings **must** not be used within the footway portion of the treatment.

Signs and Road Markings

All signs and road markings **must** comply with the current versions of the Traffic Signs Manual and the Traffic Signs Regulations and General Directions.



4.4 Managing Interaction

4.4.1 Side Street Junctions

Introduction to the Concept

To successfully deliver segregated cycle infrastructure, the interaction at side street junctions is very important because junctions are locations of elevated collision risk compared with links. These priority junctions tend to be T-Junctions and the treatment to encourage more active travel, reduce turning traffic speeds and facility segregated infrastructure can vary.

Priority Junctions can be split into 3 design groups: *Full Set Back, Partial Set Back* and *No Set Back*.

Full Set Back provides space for turning vehicles to stop and give way to people walking, wheeling and cycling with turning vehicles clear of the main road.

Partial Set Back provides some space for turning vehicles, while *No Set Back* provides no turning space.

Continuous footways are a form of No Set Back design, and this is discussed in 3.6, although main roads with buffers may create set back space.

This guidance uses Passenger Car Units (PCUs) which is predominately used in traffic modelling. Table 1[17] outlines PCU values for vehicle types.

Vehicle Type	PCU Value
Pedal Cycle	0.2
Motor Cycle	0.4
Passenger Car	1.0
Light Goods Vehicle (LGV)	1.0
Medium Goods Vehicle (MGV)	1.5
Buses and Coaches	2.0
Heavy Goods Vehicles (HGV)	2.3
Articulated Buses	3.2

Table 1: PCU Values for Vehicle Types

17. Transport for London Traffic Modelling Guidelines V4

Case Studies

In the early 2000s London started installing raised entry treatments to their side road roads and studied the effect across different areas, with priority not changed. They reviewed sites on their busy Red Routes and quieter Borough roads.

The installation of raised entry treatments on the busier routes found no overall change in collisions of all severities, however their model did suggest significant reductions, of 20% in pedal cycle collisions. Some other classes of collisions, like powered two-wheelers and right turning traffic collisions were estimated to increase.

The installation of raised entry treatments on the local Borough roads found an estimated 20% reduction in overall, with all the statistically significant results showing reductions. This included total collisions, slight collisions, non-pedestrian and pedal cycle collisions, and right turning.

This suggested that on the main dual lane arterial routes with low pedestrian flows did not work as well as the Borough roads which were single carriageway with higher pedestrian flows.[18]

A study carried out by City of Edinburgh Council on their cycling infrastructure on Leith Walk found that it was important to implement priority junction designs consistently. The use of continuous colours and materials with clear road markings on give way locations was important to ensure understanding and compliance with all road users.

Leith Walk had both full setback and partial setback designs for segregated cycling, however, these are being altered under the installation of new tram works.[19]

A study was carried out to understand public attitude to new priority junction designs[20]. The main findings from the study were that the majority of respondents supported the idea of safer junctions for all road users, however, for them to be understood, they needed to be clearly outlined. The report highlighted that there was a missing link between design standards and regulations at the time, and that changes to regulations were required. The new priority change to the highway code should provide more clarity to the design process and the public's understanding.

Figure 4.35: Side street junction in Edinburgh where road marking and a raised table are used to give people cycling and walking priority.

18. Effect of side raised entry treatments on road safety in London, TRL (2006)
19. Leith Walk cycling infrastructure analysis, CEC (2018).
20. Understanding attitudes to priorities at side road junctions - Jonathan Flower and John Parkin (UWE) 2019

Design Requirements

Full Set Back

These designs are also called Bend Out designs and they **should** be used:

- When the flows on the minor arm are around 2,000 PCU/day (Passenger Car Unit)
- With raised crossing points for both people in the footway and in the cycle way
- The give way markings should be minimum 5m back from the major road kerbline
- Radii at the junction 4m desirable, 6m max.

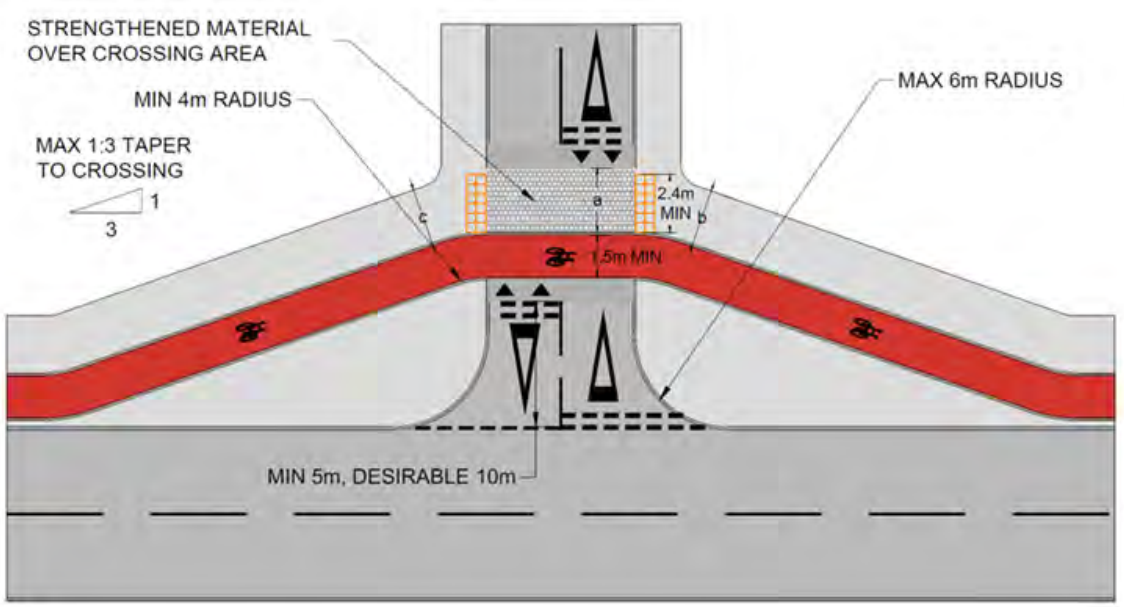


Figure 4.36: Schematic of set back junction where people walking and cycling are given visual priority over those driving.

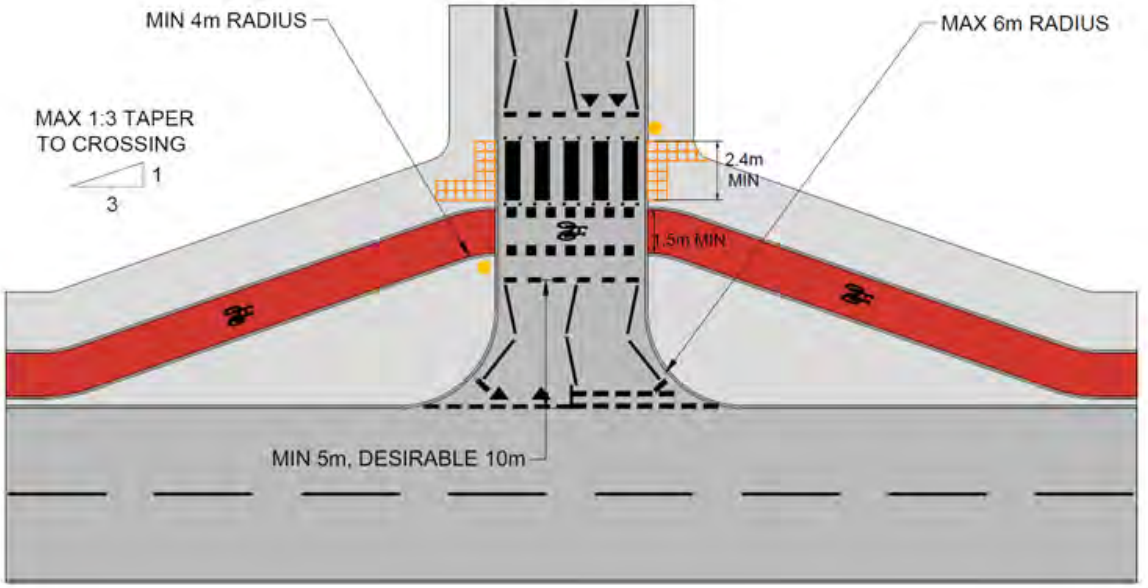


Figure 4.37: Schematic of set back junction where zebra crossing is used to give people walking and cycling legal priority over those driving.

Partial Set Back

These require less space to implement than the Full Set Back design and should:

- Have flows on the minor arm less than 2,000PCU/day
- The major road should have sufficient gaps in free flow traffic to limit queuing on the major road
- If radii at junction used, 4m desirable, 6m max

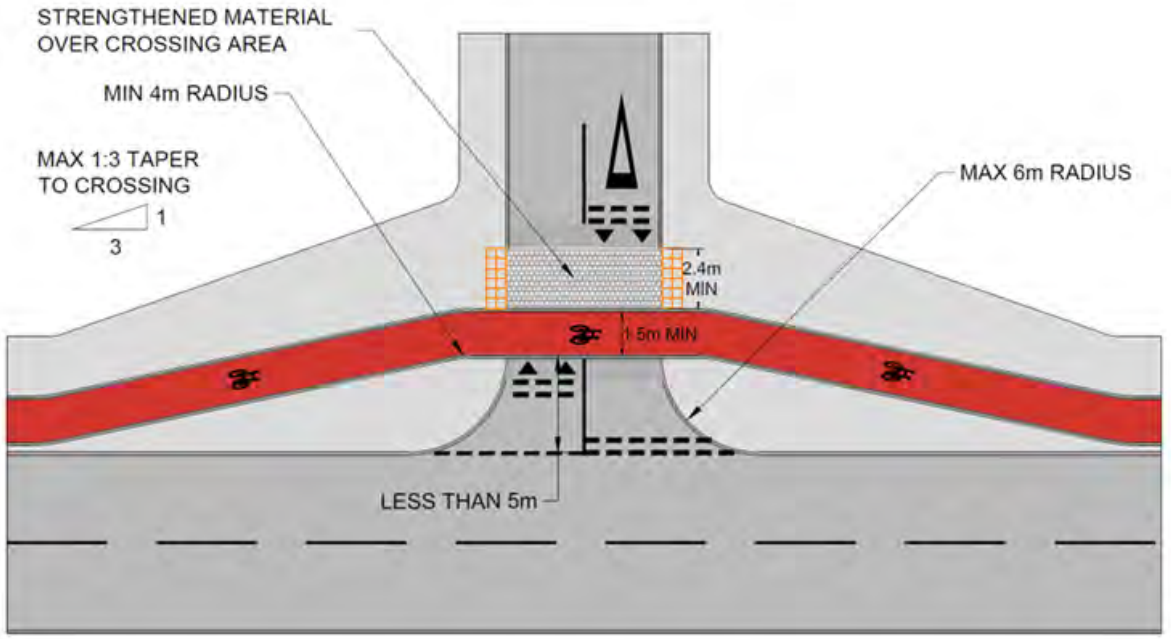


Figure 4.38: Schematic of partially set back junction where the cycleway is less than 5m distant from the main road which does not give a full car length for driver to wait in.

No Set Back

These can be provided without giving priority to people walking, wheeling and cycling when turning in, however, with suitable markings and materials, the cycle lane can be visually dominating to encourage motorists to give way to cyclists at the junction. To give full priority to non-motorised traffic, a continuous footway design is recommended, see 3.6 for details.

These designs should be used when:

- The minor road has low traffic flows (especially HGVs), with less than 100 vehicles per hours at peak
- The Minor Road and Major Road has speed limits 30mph or less

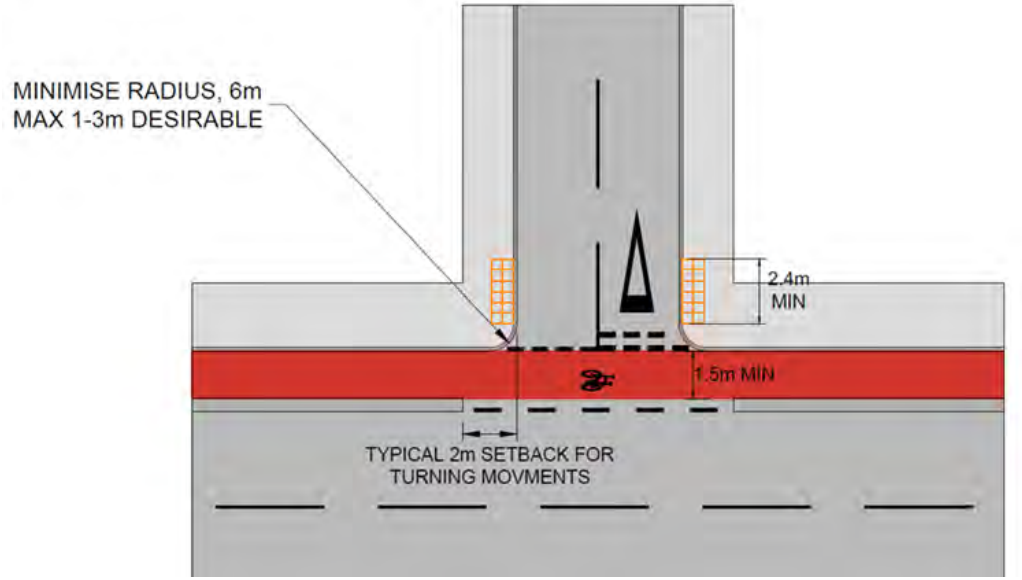


Figure 4.39: Schematic of no set back junction with uni-directional cycleway.

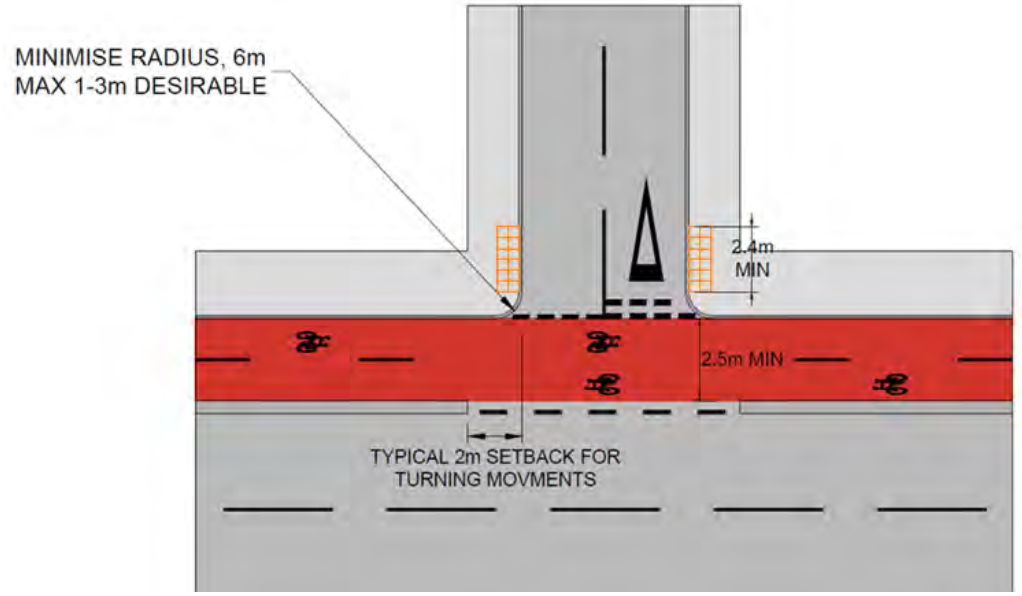


Figure 4.40: Schametic of no set back junction with bo-directional cycleway.

Junction Radii Reduction

Light segregation implementations can be used to provide immediate change to junctions that have high entry speeds or overly open radii for turning manoeuvres. The Spaces for People schemes implemented in 2020 used light segregation along with road markings and in some instances surface applied coloured screeds to narrow junctions to reduce entry speeds and provide better protected space for people walking and cycling.

Figure 4.41 shows an example in Edinburgh at the Comiston Springs Avenue Junction. This took a wide junction and narrowed the running lanes and junction radii using the bolt down units and road markings. It created a shorter crossing point for people walking and provided a shorter section of unprotected cycle lanes over the mouth of the junction.

Figure 4.41: Side street junction in Edinburgh where paint and bolt down bollards have been used to significantly reduce road width to create safer pedestrian crossing environment.

By using these materials, a design could be quickly implemented and changed cheaply and easily on site. Following the trial of the design, permanent materials can be implemented to finalise the design. Radii to be reduced to minimum possible for turning vehicles expected, 3m desirable radius

- Bolt down units to be positioned at sufficient spacing to deter vehicles trying to enter the closed space
- Visibility splay from junction to be checked under new arrangement

Further design information can be found in:

- Cycling by Design 2021, Section 3.10, Paragraphs 3.10.1 to 3.10.7

Further design information can be found in

- Cycling by Design 2021, Section 5.2, Para 5.2.4-5.2.30
- LtN1/20 Section 10.5 Priority Junctions
- City of Edinburgh Council – Edinburgh Street Design Guidance – Factsheet G7 Priority Junctions

4.4.2 Continuous Footways

Introduction to the Concept

Continuous Footways provide priority to people walking and cycling across side road junctions, over turning motor traffic. This is achieved by using materials and geometric design which show footways (and cycle tracks) unbroken through the side road junction. The most effective continuous treatments achieve "visual priority" using materials, although road markings and appropriate vertical signage can be used to show of drivers to yield to pedestrians and cyclists.

Continuous Footways are also a tool to indicate to drivers that they are changing environment, usually from a main road with through-traffic function to a neighbourhood street which has a largely access function.

Additional information on continuous footways can be found in Glasgow City Council's Public Realm Design and Maintenance Guide.

Case Studies

A study carried out into the effectiveness of ten continuous footway sites in the UK (6 London, 1 each in Leeds, Nottingham, Southampton and Edinburgh), was conducted in 2020[21]. Each of the sites had slightly different characteristics due to location, pedestrian flow, vehicular turning numbers etc.

Two of the sites had no specific cycle provision, two had uni-directional cycle provision, one had a bi-directional cycle provision and the remaining 5 had a stepped cycle track (i.e. kerbed segregation).

The study found that the majority (91.3%) of integrations where road users took the priority or could have. The report highlights that it is important that the geometric design of the footway to reduce vehicle turning speeds. They also found that there was no evidence that continuous footways should not be used above a certain level of turning flow.

The study concluded that continuous footways work best where there are higher pedestrian and cycle flows; low vehicle turning counts; lower flows on the main road; for outward turning movements from the side road (on both two-way and one-way out operation); for inward turning flows to the side road where there are mitigating factors; uni-directional cycle tracks reducing traffic movements at the junction by area wide traffic management. More examples of good practice in continuous footways should be constructed to enable further study into which design factors and flow patterns work best.

21. Jonathan Flower, Miriam Ricci and John Parkin (2020) "Evaluating the effectiveness of continuous side road crossings"

Design Requirements

For the successful implementation of continuous footways these conditions **should** be met:

- The minor road has low traffic flows (especially HGVs), with less than 100 vehicles per hour at peak
- Ideally have medium to high pedestrian flows, ≥180 pedestrians per hour. When pedestrian flows are expected to be lower than this the junction **must** have less than 100 vehicles per hour at peak.

These conditions **must** be met:

- Minor Road and Major Road to be 30mph or less
- No radius kerbs
- No perpendicular kerbing across continuous footway or cycle way
- When a cycle way is present, it must be raised through the junction to the footway level
- No parking on minor road within 5m minimum of the end of the minor road, as measured from the give way markings.
- No parking on the major road that blocks the junction's visibility splay

When traffic flows are higher or pedestrian flows are lower, turning traffic will be less likely to observe the changed priority.

When traffic flows are higher than recommended, turning traffic will be less likely to observe the pedestrian/cyclist priority. In this situation, the wider traffic circulation should be investigated to see if there is a destination creating traffic demand or if there is a through route containing undesirable volumes of traffic off the main road network. If modal filtering or demand management at the destination can reduce volumes of turning traffic, these solutions should be implemented before a continuous footway treatment is discounted.

Figure 4.42: Example of continuous footway across a side street junction in London with someone crossing. Foreground shows blue coloured cycleway.

One-way on the minor road is preferred as the presence of opposing turning traffic can block a driver's view of a pedestrian or cyclist. One-way also makes a more comfortable walking or cycling experience as there is assurance that traffic will only be coming from one-direction. One-way again exiting the side street presents the lowest risk situation and should be considered as part of any wider network review.

Tactile paving is used to indicate to visually impaired people that they are entering a zone where interaction with traffic is possible. Paving is set back from the junction mouth so that the visual continuity of the footway is not broken.

The differences in length between f and g in *Figure 4.46* create a virtual swept area. This means that a swept area exists for larger vehicles so that they can negotiate the corner, but that the junction radii look relatively tight to the majority of drives. This feature along with the ramp (e in *Figure 4.45*) is an integral part of the continuous footway because it emphasises the visual priority of the continuous footway and ensures slow turning speeds.

Give way markings on the minor road are preferred but can be omitted if the flows on the minor road are very low.

Figure 4.43: Example from Glasgow of side street junction where road is raised to footway level.

Figure 4.44: example from Glasgow of Side Street junction where high quality paving is used with steep ramp up to slow vehicles.

Figure 4.45: Example from Netherlands of continuous footway across side street junction. A person is running with their dog across the footway.

Geometry Design

To visually show the priority arrangement a consistent use of materials and junction geometry **must** be used.

These dimensions must be met/followed:

a. Not less than adjoining footway widths

b & c. Existing widths of adjoining footway

d. Not less than 1.5m

e. Desirable 1:5, Minimum 1:10

f. 2-4m greater than g

g. 4.5-6m (maintained minimum 5m beyond back of footway) for two-way roads. For one-way roads max 3m.

The footway area over the junction will need to be strengthened to take the additional loads from vehicle movements. The material type can be changed, i.e., from HRA to high strength paving slabs or small element paving but must not be visually similar to the carriageway on the minor or major road.

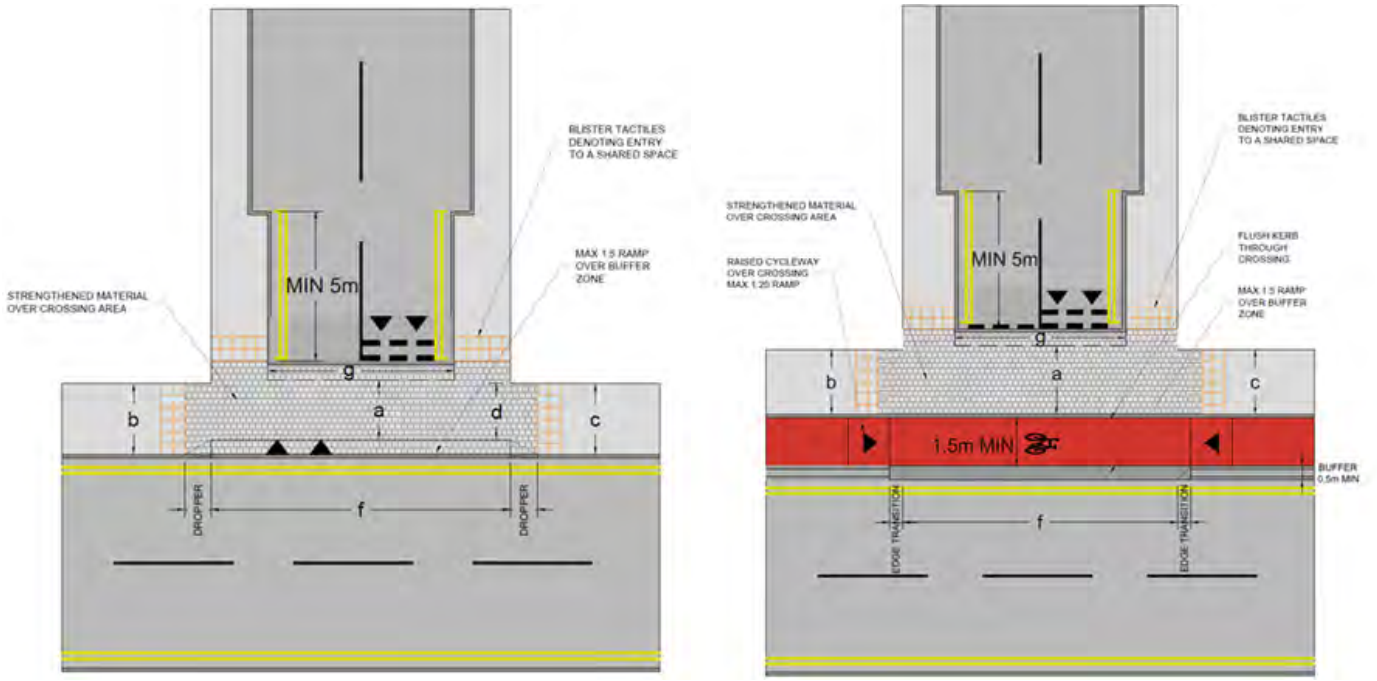


Figure 4.46: Schematic layout of continuous footway both with and without a cycleway.

The ramp access from the major road can be formed by a dropped kerb arrangement or using the Dutch-style deep ramp access kerbs. The ramp access from the minor road can be formed through bituminous material and have a lower gradient, 1:15.

Other factors such as drainage and presence of bus routes or other heavy traffic are used to adapt designs to specific street contexts and ensure materials will adequately stand up to vehicle loading requirements.

When a cycle way is incorporated, it will be segregated by kerb on approach and after the crossing with a splayed kerb. The kerb will need to transition into a flush kerb prior to the cycle way ramp to allow for a square edge to compact the cycle way ramp material against. If the kerb is not flush, there is a risk of cycle wheels being caught by an upstand. The cycle way will be flush with the footway, separated by a flush kerb, channel kerbs would provide cleanest flush edges. There **must not** be any perpendicular kerbing at the junction, i.e., across the cycle way or footway.

Footway crossovers take one of two forms: light and heavy. light crossovers are used to access something with a low level use, such as a lane, suitably quiet side street or property. Light crossovers should provide restricted access to cars or light vehicles. They should provide a step free footway surface for the crossover with a dropped kerb or rmap detail.

Heavy crossovers are used by Heavy Goods Vehicles for deliveries and servicing requirements. A step free surface is preferable which should be suitably robust. This may require using the same material but in smaller or deeper set paving units.

Further Design Information

Further Design Information can be found at:

- Cycling by Design 2021, Section 5.2, Para 5.2.4-5.2.30
- LTN 1/20 Section 10.5 - Priority Junctions
- City of Edinburgh Council – Edinburgh Street Design Guidance – Factsheet G7 Priority Junctions

Cycling by Design is updated guidance for the introduction of cycling infrastructure published in 2021.

4.4.3 Crossings and Bus Stops

Introduction to the Concept

Regular pedestrian crossing opportunities should be provided on all routes, and at locations where a walking route crosses a major road or cycle route. Crossings should be located as close to the pedestrian desire line as possible.

All road crossings which connect to a cycle route should be of a type able to be used by both pedestrians and cyclists. Where site conditions allow, a crossing type which avoids the need for shared space between pedestrians and cyclists should be selected, typically either a 'Parallel Zebra' or 'Signalised Parallel' crossing.

All crossings must be step-free, which can be achieved either through the provision of dropped kerbs or by placing crossings on a raised table or entry treatment.

For stand-alone pedestrian crossing of cycle tracks, the basic options are:

Uncontrolled Crossing

As with uncontrolled crossing of the main carriageway, this arrangement consists of a dropped kerb, or raised table or hump, with appropriate blister tactile paving. Further signing **may** be added to promote courteous behaviour, and additional cycle speed calming measures **may** be appropriate. Contrasting tone and surface material may be considered, to support legibility by people with low vision.

Signal-controlled Crossing

This is not generally recommended unless as part of a larger junction. Blister tactile and tactile tails are required.

Zebra Crossing

As established in TSRGD (2016), a conventional zebra crossing may be applied to a cycle track and give priority to pedestrians crossing. Used in this way, the zebra crossing does not require zig-zag markings and belisha beacons are optional. Blister tactile, including tactile tails, is required to help people with visual impairments to find the crossing. Where the crossing is on a hump, then the Highways (Road Humps) Regulations 1999 apply, meaning that the crossing must be centred on the hump.

For segregated and light segregated lanes, pedestrian crossings **should** extend from footway to footway.

Crossing – Roads

The table extracted from LTN 1/20 shown in *Figure 4.47* outlines the provision types based on the speed limit, total crossing traffic flow and the number of lanes being crossed. For a cycle route crossing a carriageway, the most suitable crossing choice generally depends on the traffic conditions of the street.

Speed Limit	Total traffic flow to be crossed (pcu)	Maximum number of lanes to be crossed in one movement	Uncontrolled	Cycle Priority	Parallel	Signal	Grade separated
≥ 50mph	Any	Any					
40 mph and 45 mph	> 10000	Any					
	6000 to 10000	2 or more					
	0-6000	2					
	0-10000	1					
< 40mph	> 8000	> 2					
	> 9000	2					
	4000-8000	2					
	0-9000	2					
	0-4000	1					

Provision suitable for most people

Provision not suitable for all people and will exclude some potential users and/or have safety concerns

Provision suitable for few people and will exclude most potential users and/or have safety concerns

Notes:
1. If the actual 85th percentile speed is more than 10% above the speed limit the next highest speed limit should be applied.
2. The recommended provision assumes that the peak hour motor traffic flow is no more than 10% of the 24 hour flow.

Figure 4.47: Table from UK guidance showing type of crossings appropriate for different street depending on traffic volumes and other factors.

Figure 4.48: Aerial image of crossing which has protected cycleway crossing alongside pedestrian crossing.

Case Studies - Crossings

The figures below show before and after images of a new parallel signalised crossing in Cheadle Hulme, Stockport. This crossing is one of the first parallel signalised crossings in the UK, providing people walking, wheeling or cycling their own dedicated facilities.

Figure 4.49: before image of standard pedestrian crossing.

Figure 4.50: after image of crossing which has protected cycleway crossing alongside pedestrian crossing.

Design Requirements

Crossings

For guidance on crossing layouts refer to Traffic Signs Manual Chapter 6 and Cycling by Design.

Bus Stop Bypasses

Delivery of the City Network will have significantly more investment per km than Spaces for People and there is a longer timeframe to deliver higher quality solutions at these areas of interaction. The City Network will deliver bus stop designs of quality comparable with those recently delivered on Garscube Road and Victoria Road, as shown in *Figure 4.50*.

The following information sets out the design of such bus stop bypasses in space constrained situations. Where more space is available, widening of the footway, cycle way, and bus stop boarding area brings significant advantage.

Where space permits a bending out bypass design **should** be considered. This design pushes the footway out to provide space for a bus stop island. This island can be made from permanent materials such as concrete kerbs and built up with bituminous footway materials or could be made from more temporary materials such as bolt down rubber kerbing units and infilled with temporary asphalts.

Where there is not space to push the footway out, an inline bypass design **may** be appropriate. This uses the same principles as the bend out design however road users will be guided into a narrower carriageway at the bus stop to provide the bus stop island.

Figure 4.51: Bus stop bypasses on Victoria Road Glasgow.

When providing a bus stop island for both design types it must:

- Be 2.5m wide to provide a 2x2m boarding/ alighting space and a shelter.
- Have a minimum 1.5m wide cycle lane
- Have at least one crossing point for people to access the island from the footway, the crossing point will have blister tactile paving on the footway and island, and zebra markings in the cycle lane. If only one crossing is used it must be near the boarding/alighting area for ease of navigation and orientation by alighting passengers
- If a crossing point is located after the shelter, it must be sufficiently far enough to provide good forward visibility for people cycling to

Figure 4.51 provides more detail on bus stop design layouts.

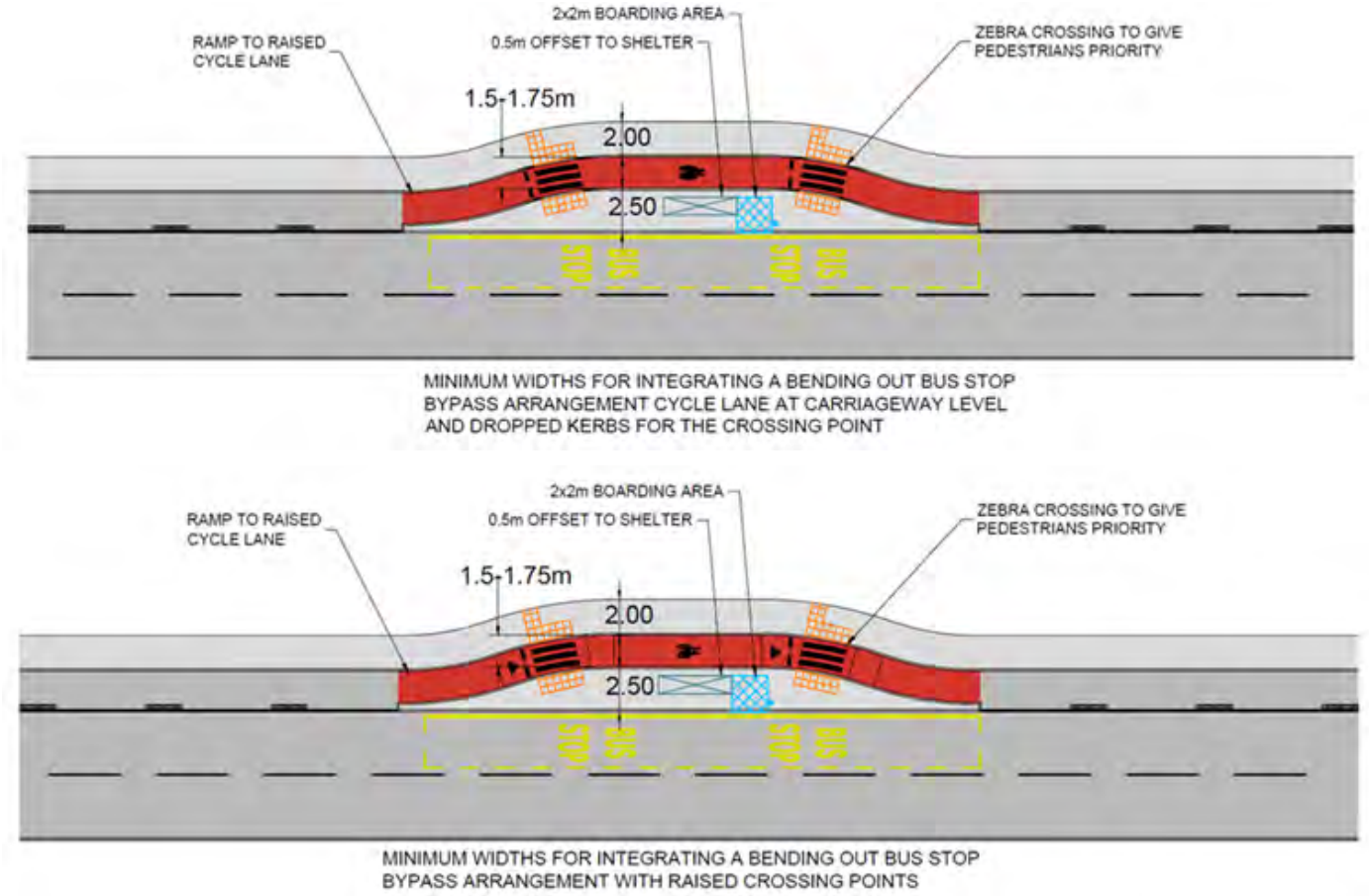


Figure 4.52: Schematic images of bus stop bypasses where footway has space to bend out to create extra street space.

For bend out designs it should:

- Have a minimum new footway width of 2m
- The new footway material should match the existing
- For inline designs they must:
- Have a maximum (steepest) taper of 1:20 to allow a smooth transition of traffic
- Have a minimum carriageway width of 6.5m at the bus stop, minimum width that allows two buses to pass.

For inline designs they should:

- Have a minimum footway width of 2m, which can allow the existing footway width to be reduced to provide the suitable space for the island
- If the existing footway is below 2m then it may be kept at existing widths, however if it can be widened it should
- Maintain cycle way width. In the above example cycle way width is reduced to 1.50m at the bus stop but it should be noted that this is to provide sufficient space for bus boarding area rather than to slow down people cycling
- Position the zebras and choose bus shelters so that sightlines are not blocked

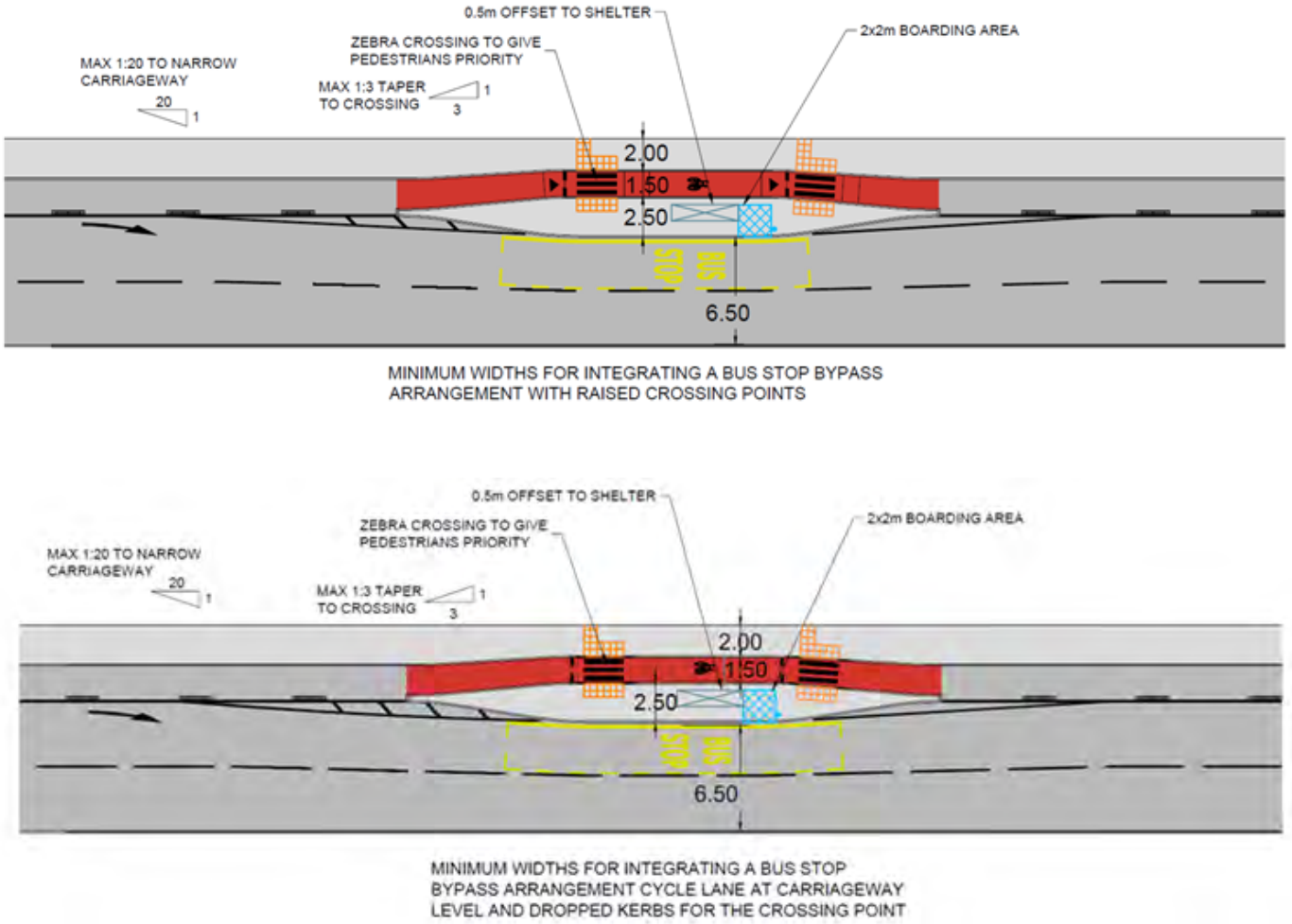


Figure 4.53: Schematic images of bus stop bypasses where carriageway and cycleway need to be reduced in width to allow space for passenger waiting area.

For both designs the cycle lane will pass unobstructed around the bus stop, with the crossings points as shown. The crossing points may be dropped crossings or raised to provide a level crossing point, which can aide in promoting pedestrian priority when crossing. When using raised crossing points this can stop the flow of water through the cycle lane and require additional drainage provision or design. Engagement with local user groups helps inform design choices of bus stop layouts.

On steep downhill gradients consideration should be given to likely increased cycle speed as a factor in deciding how best to promote safe cycle-bus user interaction. Consideration should also be given to moving the bus stop away from the downhill area if this does not cause access issues to destinations or the bus stop.

Accessible bus stop design guidance within Cycling by Design (2021) outlines the use of a 2m x 2m desirable boarding area as well as two types of bus bypass: with an island and with a continuous island. The accessible bus stop design guidance summarises: “Enough space for the wheelchair ramp to deploy from the bus and for the wheelchair user to be able to turn on the island in order to get on or off the ramp. The island should be at least 2.5 metres wide in order to allow this to take place in comfort.”

The design of bus stop bypasses must consider cycle slowing measures to encourage people cycling to slow down and facilitate easier interaction with bus users. Important to note that any measures intended to slow people cycling should not result in attention focussed down due to high vertical kerbs or large horizontal deflection. Past examples have included narrowing the cycle track behind the bus stop to give bus users less distance to cross.

Any layouts must consider the utilisation of visual contrast, ideally with 50% difference. This should be provided between both the crossing area and the footway with the cycle track, to alert cyclists to the crossing, alert bus passengers to the cycle track and to highlight the crossing area for bus passengers with vision impairment.

In addition to the above, bus stop bypasses must offer good inter-visibility between cyclists and bus passengers. The introduction of any bus stop shelter that incorporates advertising and information panels needs to be done in a way that avoids blocking sight lines, particularly on bidirectional tracks.

The cycle track crossing should be on the main identified pedestrian desire line. Where this requirement is met, the crossing should also be of sufficient width to accommodate expected pedestrian volumes at peak flow times of day.

More than one crossing point may be considered where there is more than one flag at a given stop or, potentially, where there are large numbers of bus passengers and/or pedestrian desire lines do not align with a single crossing location.

Generally pedestrian-cycle interaction is managed through uncontrolled or some form of controlled crossing. Zebra crossings across the cycleway to the bus stop are currently the most common standard form in Glasgow. The zebra crossing provide a good balance between replicating the observed behaviour at bus stops while giving pedestrians clear priority at crossing points.

New accessible systems are being developed which provide information to visually impaired people, through tactile cone, that there aren't any cyclists approaching the crossing. Glasgow City Council will stay informed of such technological development and conduct trials of systems where appropriate.

Interaction between people cycling and people crossing the cycleway at bus stops has been the subject of several research project in the UK. The studies set out to better understand the nature of those interaction and how to better promote pedestrian/bus user priority at these crossings.

Below are excerpts from these studies.

"More people believe pedestrians have priority at the crossing, More pedestrians use the crossing, there were only small increase in the number of people noticing the crossing, Belisha beacons at two of the study sites appear to have made little difference in user perceptions of the crossings, there were some increase in pedestrians' stated comfort and safety following the introduction of zebra crossing, zebra crossings have some impact on the way people cycle through the bus stop area." **Bus Stop Bypasses Surveys of Pedestrians and Cyclists – Greenshields S, Davidson S. TRL Published**

"We monitor the entire Cycle Superhighway network to ensure it is operating safely and effectively. This includes more than 50 bus stop bypasses across the capital. Our research has found that bus stop bypasses are safe for all road users, including bus passengers." **TfL Bus Stop Bypasses**

"A Zebra crossing reduced the probability of interactions between cyclists and pedestrians. Dropped kerbs (no ramp) were generally preferred at the Zebra crossing unless the pedestrian flow was high (greater than triple the cycle flow + 3 pedestrians). Pedestrians and cyclists felt safer with a dropped kerb. The Bus Stop Bypass appeared to be attractive to cyclists. Between 45% and 50% of the cyclists stated that they would be more likely to cycle in town with Bus Stop Bypasses being available. The Bus Stop Bypass appeared to have advantages for cyclists' perceived safety, compared with using the main carriageway, whilst not unduly affecting their journey times or pedestrian safety. An at cycle track level designated crossing point was preferred. Such a crossing point was perceived as safer by cyclists. A Zebra crossing had advantages and disadvantages for cyclists. Cyclist journey times were generally lower without a Zebra crossing, particularly under high cyclist flows." **Off-street trials of a Bus Stop Bypass, York I and Tong S – Transport Research Laboratory (TRL)**

4.5 Larger Junctions

4.5.1 Kidney Bean Junctions/Priority Squares

Introduction to the Concept

Kidney Bean Junctions or Priority Squares restrict vehicular turning movements at the actual intersection points, but still allow all direction of travel within the junction itself. Although uncommon in the UK, these junction arrangements could be a useful tool on larger roads to manage side street junctions.

This is a junction type developed in the Netherlands to assist with the flow of traffic where low traffic side roads meet a major distributor road. It has the characteristics of both a priority junction and also a roundabout.

It features a stretched and elongated shape, and through traffic on the main road will always have priority.[22]

Safety is a high priority, with the layout designed to separate conflicts from each other as much as possible, and to ensure any conflicts occur at slow speed.

Case Studies

Figure 4.54: Aerial and on street images of kidney bean style junction in Netherlands.

22. https://www.wegenwiki.nl/Voorrangsplein

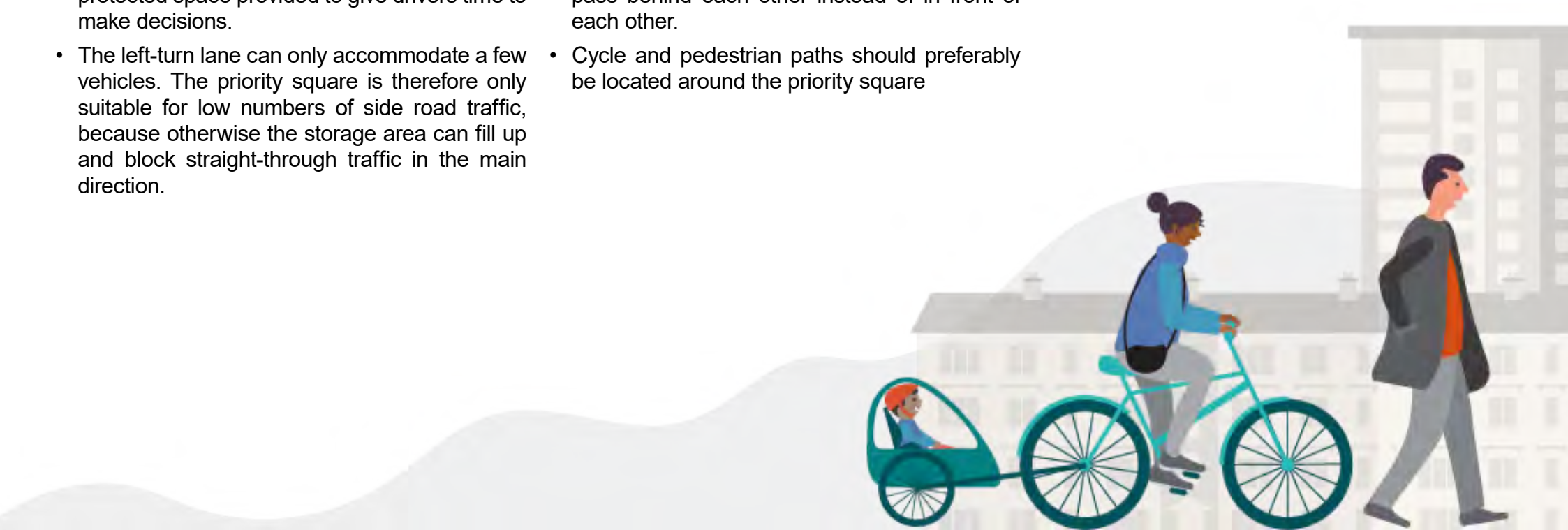
Design Requirements

Design requirements for protected signal-controlled junctions are set out within Cycling by Design.

Tactile paving must be provided at all pedestrian crossing locations in accordance with Guidance on the use of Tactile Paving Surfaces.

Some design principles (based on right-hand side driving) include:

- The main direction always has the right of way, including slow traffic.
- Traffic turning left from the main road has a storage lane in the middle, so that straight-through traffic is not hindered. This also allows the movement to be done in stages, with protected space provided to give drivers time to make decisions.
- The left-turn lane can only accommodate a few vehicles. The priority square is therefore only suitable for low numbers of side road traffic, because otherwise the storage area can fill up and block straight-through traffic in the main direction.
- Side road traffic will always route via the protected left turn lanes and wait for gaps in traffic on the main road in order to either join the main road, or make the move to the next protected space
- The two left-handers on the main direction pass behind each other instead of in front of each other.
- Cycle and pedestrian paths should preferably be located around the priority square



4.5.2 Signal Controlled Junctions

Introduction to the Concept

The default position, where site conditions are appropriate, should be to implement protected signal-controlled junction layouts. These layouts provide dedicated space at a signalised junction for people cycling, allowing them to make all desired movements separate to motorised vehicles. Signal staging and timing should be configured to ensure right turns can be achieved in a single movement and with minimal delay.

Cycling by Design states that the key design principles are:

- Pedestrian crossings of the cycle track and road carriageway should be on clear desire lines and should be as consistent as possible to ensure familiarity by all users
- The layout should avoid cycle track users stopping any more than is necessary to manage the interaction with motor traffic
- Visibility at interaction points should meet the necessary requirements
- Space should be taken from the road carriageway rather than from the pedestrian footway.

Spaces for People+ concept proposes that signalled junctions on the City Network are upgraded to enable safe cycling while also implementing any necessary pedestrian upgrades. This allows budgets and resource to be focussed on these junctions where most collisions between people driving and cycling occur.

Protected junction on Victoria Road in Glasgow (Source: Sustrans)

Case Studies

Figure 4.55 shows an example from Manchester which uses bolt down kerbs to create a protected segregated cycle link between traffic and cyclists on approach to a signalised junction.

This link allows people to cycle safely between protected junctions implemented with permanent measures. Note that usually filtering on the left of such a large vehicle would be incredibly dangerous, but the link and junction infrastructure allows separation of modes, enabling the person cycling to safely move up and take position in the protected portion of the junction.

Figure 4.55: Bolt down kerbs leading to protected cycling junction in Manchester. Large HGV is waiting at lights but junction layout means those cycling do not have to interact with motor traffic.

Transport for Greater Manchester have successfully installed a CYCLOPS (Cycle Optimised Protected Signals) junction on Royce Road, Manchester and have plans to implement further CYCLOPS junction layouts within the city.

The junction fully separates cyclists from motorised traffic through segregated cycle lanes and therefore, minimises the risk of collisions, especially from 'left-hook' collisions. The CYCLOPS employs an external orbital cycle route connecting the four arms of the junction and forms a protected route for cyclists from motorised traffic.

Prior to the construction of the CYCLOPS junction, complaints were received from both cyclists and pedestrians regarding the existing facilities. Cyclists were not satisfied with the unsafe facilities on principle routes and junctions in particular. Pedestrians highlighted their dissatisfaction with cyclists using the footways and therefore, posing safety concerns for pedestrian users. The installation of the CYCLOPS enables segregation from users while ensuring protection for cyclists and pedestrians walking around the junction. The junction reduces the number of phases for all movements through the give-way-to-the-right principle where the cyclists are determined as a separate vehicular entity independent of motorised vehicle and pedestrian traffic. In addition, with the CYCLOPS, there is the potential for cyclists to make fully protected 2-phase-right-turns in one movement while transiting through the junction however this is dependent on the signal timings and current congestion status.

Figure 4.56: Aerial image of the first CYCLOPS style protected junction in Manchester.

Design Requirements

The design requirements for protected signal-controlled junctions are set out within Cycling by Design. The various layouts for protected signal-controlled junctions have been provided in the figures below. Dimension R(a) should be designed to facilitate all expected left –turning vehicle movements but should be a maximum of 6m to limit vehicle turning speeds. Dimensions R(b) and R(c) should be a minimum of 4m.

Note the layouts above taken from Cycling by Design 2021 require the appropriate tactile paving designs. Tactile paving must be provided at all pedestrian crossing locations in accordance with Guidance on the use of Tactile Paving Surfaces.

All road markings associated with protected signalised junctions must conform to TSRGD.

Figures 4.57-4.60: Schematic images of different possible layouts and signal combinations for protected junctions.

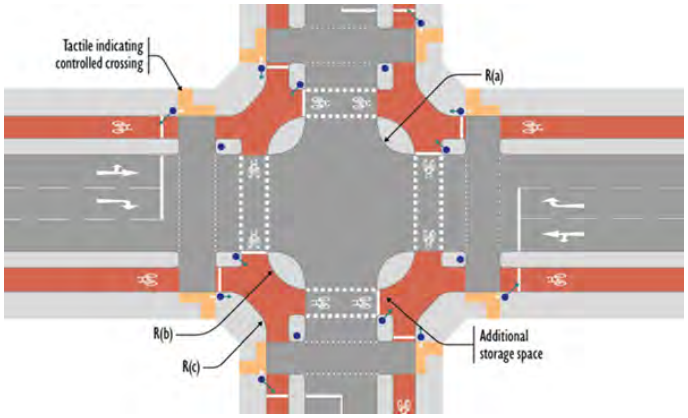


Figure 4.57 Protected signal-controlled junction layout (including internal stop lines) (Cycling by Design 2021)

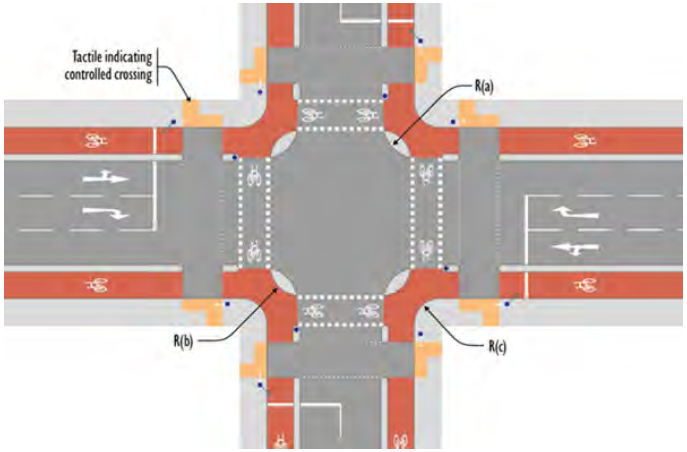


Figure 4.58 Protected signal-controlled junction layout (no internal stop lines) (Cycling by Design 2021)

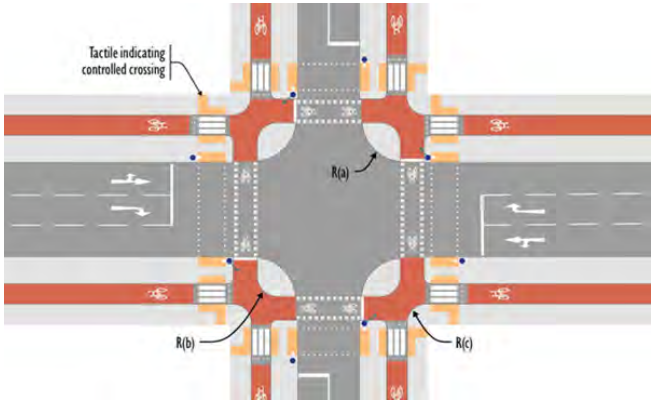


Figure 4.59 Protected signal-controlled junction layout with Zebra crossing of cycle track (Cycling by Design 2021)

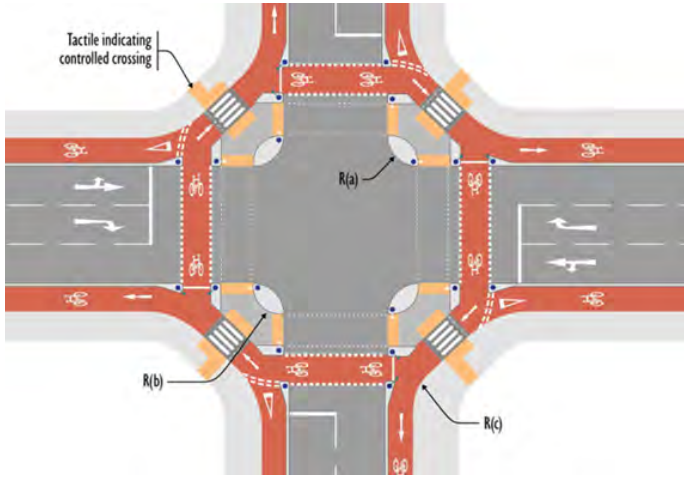


Figure 4.60 CYCLOPS Protected signal-controlled junction layout with Zebra crossing of cycle track (Cycling by Design 2021)

Design Requirements

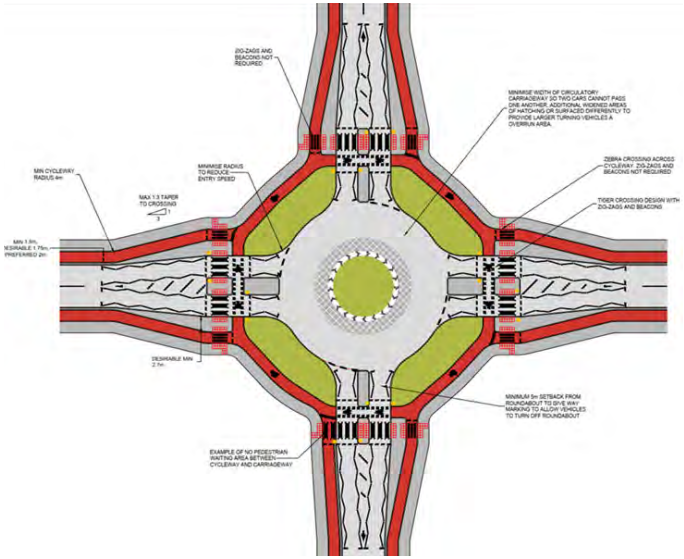


Figure 4.61 Schematic image of how to safely incorporate pedestrian and cycling movement at a roundabout.

Case Studies

Protected roundabouts are commonly used in Europe, however, the UK's first protected roundabout was installed in Cambridge in July 2020.

The roundabout provides an outer ring for cyclists while also featuring parallel zebra crossings which extend over the cycle lanes so both pedestrians and cyclists have equal priority over oncoming vehicles. In addition to being designed to accommodate all users, the roundabout is designed to encourage motorists to drive at a lower speed and therefore, reduce the risk of collisions with pedestrians and cyclists. To accommodate large vehicles, the roundabout employs an over-run area to allow efficient manoeuvrability around the roundabout.

Prior to the construction of the new Fendon Way and Queen Edith's Way Roundabout, the existing roundabout formed a barrier to children travelling to/from school and commuting cyclists travelling to/from local hospitals, educational establishments, and places of work. Firstly, on each arm of the roundabout, there were only central islands for pedestrians and cyclists to use. Additionally, the roundabout had a wide carriageway which enabled vehicles to travel at high speeds on the approach to and within the roundabout itself. Lastly, there were no traffic calming measures to require vehicles to slow down when using the roundabout during off-peak times as there were no designated priority crossing points for pedestrians or cyclists.

The redesign and implementation of the protected roundabout provides pedestrians and cyclists with priority over motorists and therefore enabling a safer and more inclusive facility for all users which will aim to encourage more people to walk or cycle in the area.

Figure 4.62: Before image of a roundabout in Cambridge.

Figure 4.63: After image of cycleway and pedestrian zebra crossings added to roundabout.

4.6 Implementation Details

4.6.1 Materials

This section provides guidance on materials choice in relation to the creation of good quality walking, cycling and wheeling infrastructure provision.

Introduction to the Concept

When implementing active travel infrastructure, it must be of sufficient quality to encourage people to travel more actively. People walking, wheeling and cycling are more vulnerable to changes in surface levels and defects.

The Glasgow City Council Public Realm Design + Maintenance guide provides more details on material selection and maintenance for footway materials. This section provides more details on the cycleway/cycle lane material details.

Cycling by Design 2021 highlights that consistent use of colour is important for all users to understand, from drivers, cyclists and pedestrians. The use of red colouring is recommended to be applied across Scotland to improve consistency.

Design Requirements

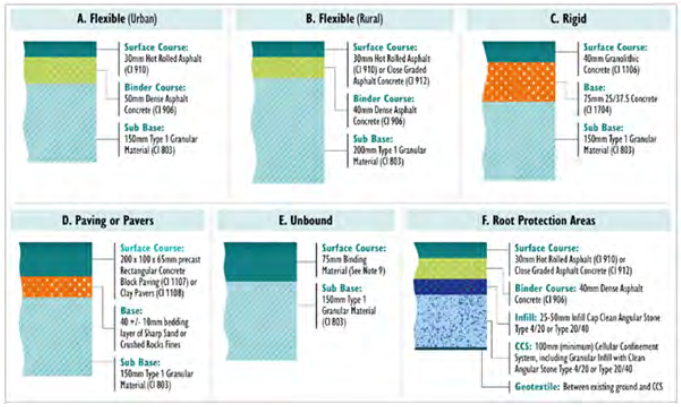


Figure 4.64: outlines of different material and base layer options for cycleway.

Pavement Surfacing:

There are generally three asphalt surfacing options available for footway and cycle links:

- Hot rolled asphalt (HRA) (15/10)
- Dense bitumen macadam (DBM) (Asphalt Concrete (AC6, AC10))
- Thin surface coarse system (TSCS)

However, a 6mm DBM surfacing offers a consistent and smooth finish, well suited to cycling and **should** be consider the default surfacing choice for cycle links.

The use of porous surfacing and low carbon materials as an alternative surfacing option **should** also be considered. This includes recycled rubber or plastic surfacing, low temperature asphalt solutions and/or the introduction of a hybrid carbon friendly recycled asphalt material.

Glasgow City Council's Public Realm Design and Maintenance Guide offers additional surfacing options such as Caithness or granite paving slabs and super nidger setts. However, paving slabs, cobbles and ungraded aggregate surfacing must be avoided for general cycling use. Where setts or cobbles need to be retained as a heritage feature, it may be possible to lay 'paths' in different surface material through such areas to enable better access for cycles, wheelchairs and other mobility aids.

It is recommended within Cycling by Design (2021) to apply a red coloured surface to cycle links to improve the visual consistency and identification of the appropriate infrastructure while also enabling better understanding by all users.

The following three applications are the most commonly used:

- Coloured asphalt
- Red Stone Chippings

Pavement Depths

The DMRB (CD 239 Footway & Cycle way Pavement Design) outlines the pavement makeup in accordance with four surfacing options: Asphalt, Pavers/setts, Flags/slabs and Concrete for footway and cycle way pavement design. *Figure 4.64* shows the tables below are taken from CD 239 and provide the pavement layer thicknesses for the respective footway and cycle way loading scenarios.

Tactile Paving

Guidance on the use of of tactile paving surfaces has recently been updated by the Department for Transport. Ensure that new guidance is followed to provide consistency in approach across Glasgow.

Table 3.18a Pedestrian-only footways and cycle-only cycleways

Layer	Surface options				
	Asphalt	Pavers/setts		Flags/slabs	Concrete
Surfacing	20 mm surface course 50 mm binder course	≥ 50 mm clay pavers	≥ 60 mm concrete blocks	≥ 50 mm	150 mm unreinforced
		30 mm laying course		25 mm laying course	
Subbase	100 mm				
Subgrade	≥ 2.5% CBR				

Table 3.18b Light-vehicle footways and cycleways

Layer	Surface options					
	Asphalt	Pavers/setts		Flags/slabs		Concrete
Surfacing	20 mm surface course 50 mm binder course	≥ 50 mm clay pavers	≥ 60 mm concrete blocks	300 mm x 300 mm x 60 mm or 400 mm x 400 mm x 65mm or 450 mm x 450 mm x 70mm		150 mm unreinforced
		30 mm laying course		25 mm laying course		
Base	-	70 mm dense AC or CBGM A C5/6 (or stronger)				-
Subbase	225 mm	200 mm	150 mm	200 mm	150 mm	100 mm
Subgrade	≥ 2.5% CBR	2.5% ≥ CBR ≤ 5%	CBR > 5%	2.5% ≥ CBR ≤ 5%	CBR > 5%	≥ 2.5% CBR

Table 3.18c Heavy-vehicle footways/cycleways

Layer	Surface options				
	Asphalt		Pavers / setts or flags / slabs		Concrete
Surfacing	25 mm surface course		As Table 3.17b		200 mm unreinforced
Base	90 mm dense AC		90 mm dense AC	100 mm CBGM A C 5/6 (or stronger)	-
Subbase	320 mm	210 mm	165 mm	150 mm	150 mm
Subgrade	2.5% ≥ CBR ≤ 4%	CBR > 4 %	2.5% ≥ CBR ≤ 5%	CBR > 5%	≥ 2.5% CBR

Figure 4.65: Table outlining different layer thicknesses for cycleways in different use cases.

Kerbs

Materials utilised for kerbs include Precast Concrete, Granite, Whin, Caithness and Porphyry. More specifically, Glasgow City Council set out within its Public Realm Design and Maintenance Guide the use of Granite, Whin, Caithness and Porphyry only for their allocation of kerb materials.

Low carbon kerb materials should also be considered as an alternative to the traditionally used kerb units.

Alternate kerb formats are present across Active Travel schemes in the UK. In Manchester, combined kerb/drainage units were used to improve design efficiency, while in Coventry the use of ramp kerb units has been employed to enable effective vehicle accessibility to minor access roads.

There is a wide range of cycle track segregation kerb formats. The most frequent forms are 45-degree splayed kerbs with 60mm upstands while 30-degree splayed kerbs with 50mm upstand are also common among projects such as the Coventry Active Travel Scheme. Cycle by Design (2021) outlines for the cycle track and footway demarcation the use of a trapezoidal segregation kerb with 20mm upstand. Also considered is the back of footway or cycle way treatment where the use of round top or flush edge kerbs are regularly implemented.

Buffer treatments are essential to maintaining pedestrian and cyclist safety. Materials utilised for the range of buffer treatments include grass/ planting, blocked paving, and asphalt.

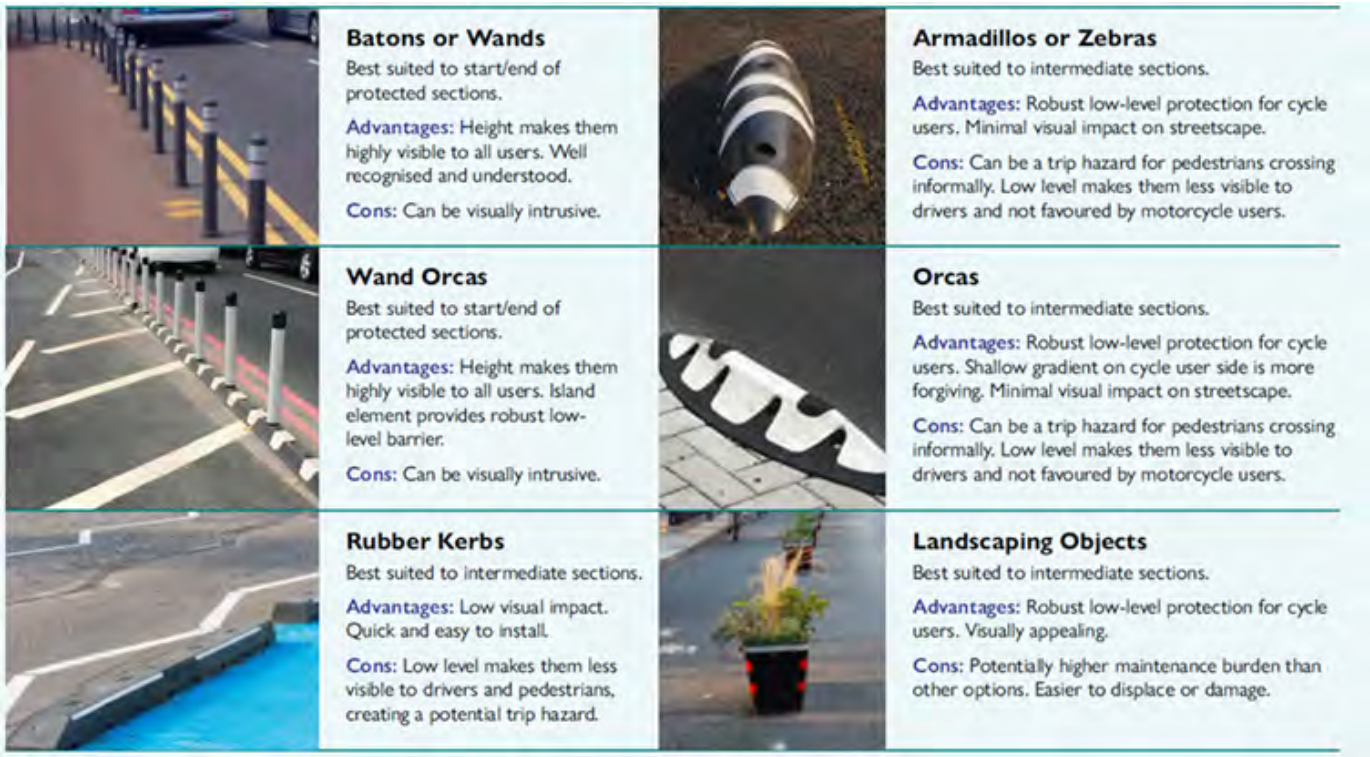
Figure 4.66. Person wearing red jacket and waiting at the cycle stop lights on Garscube Road.

Light Segregation Options

Spaces for People highlighted that light segregation cycle lane interventions are a viable option to implement segregated cycle lanes. The choice of segregation units, such as bolt down rubber kerbing or flowerpots should be passively safe to ensure that, if they are struck, they do minimum damage to people. The issues with implementing light segregation can include the build-up of detritus, such as leaves and small branches, which can narrow cycle lanes even further. They can also create issues with access to existing drainage gullies and chambers, therefore, care should be taken when installing them.

Light segregation interventions will require ongoing maintenance to ensure they are swept and kept clear. Minimum clear space between the kerb and the segregation units of 1.5m is essential to allow smaller maintenance vehicles access.

Figure 4.67 is an extract from Cycling by Design 2021 (Table 3.10) and highlights the different options available and the advantages/ disadvantages of each.



	Batons or Wands Best suited to start/end of protected sections. **Advantages:** Height makes them highly visible to all users. Well recognised and understood. **Cons:** Can be visually intrusive.		**Armadillos or Zebras** Best suited to intermediate sections. **Advantages:** Robust low-level protection for cycle users. Minimal visual impact on streetscape. **Cons:** Can be a trip hazard for pedestrians crossing informally. Low level makes them less visible to drivers and not favoured by motorcycle users.
	Wand Orcas Best suited to start/end of protected sections. **Advantages:** Height makes them highly visible to all users. Island element provides robust low-level barrier. **Cons:** Can be visually intrusive.		**Orcas** Best suited to intermediate sections. **Advantages:** Robust low-level protection for cycle users. Shallow gradient on cycle user side is more forgiving. Minimal visual impact on streetscape. **Cons:** Can be a trip hazard for pedestrians crossing informally. Low level makes them less visible to drivers and not favoured by motorcycle users.
	Rubber Kerbs Best suited to intermediate sections. **Advantages:** Low visual impact. Quick and easy to install. **Cons:** Low level makes them less visible to drivers and pedestrians, creating a potential trip hazard.		**Landscaping Objects** Best suited to intermediate sections. **Advantages:** Robust low-level protection for cycle users. Visually appealing. **Cons:** Potentially higher maintenance burden than other options. Easier to displace or damage.

Figure 4.67: Table outlining different bolt down kerb and bollard options typically available on the UK market.

4.6.2 Cycle Parking

Introduction to the Concept

The provision of cycle parking and its security are a key aspect of developing cycling as a practical transport mode option. The lack of appropriate cycle parking facilities is often seen as a barrier to cycling and could be a restriction on the potential growth of cycling within Glasgow.

The number, quality and the various types of cycle parking facilities available must, not only keep pace with the growing popularity of cycling within Glasgow but will also need to accommodate future growth as a result of the city network programme. Some, more accessible locations will see higher-than-average increases in cycling, and so will need cycle parking to align with this level of use.

Further details can be found in Cycling by Design which provides recommendations on the appropriate type of cycle parking provision based on journey origins/destinations, how long cycle users are likely to use the facility and the specific needs of users.

Case Studies

Birmingham City Centre Cycle Parking Improvements

To cater for the increase in cycling uptake from commuters and reduce street clutter, Birmingham City Council upgraded and installed a variety of cycle parking stands and racks across the city centre. M-Hoop (or M-profile) stands were installed to enable commuters and visitors to park their bikes safely, securely and within proximity to shops and other local amenities. In addition, the design also catered for the incorporation of electric bike charging points which provides for the expected future demand for electric bike infrastructure.

Figure 4.68: Cyclehoop stands providing secure cycle storage space in Birmingham.

Hammersmith and Fulham Parklet

In place of two car parking spaces, the Hammersmith and Fulham parklet enables bikes to park safely and securely on the road in addition to the creation of green space for community usage. Hammersmith and Fulham Council required the design of four bike spaces in addition to an urban park comprising planters and seating to add greenery and nature to the urban space. The parklet comes a range of adjustable formations to ensure full protection from the road along with the potential for expansion to cater for increased cycle parking capacity and greater social gathering space.

Figure 4.66: Parklet providing a bit of greenery and extra café seating as well as cycle parking in London.

Design Requirement

Table 11-1 within LTN 1/20 provides suggestions on minimum cycle parking capacity for different types of land use e.g retail, leisure, residential.

In a street environment, it is preferable to locate cycle stands such as Sheffield or M-profile stands on reallocated carriageway space providing pedestrian desire lines, kerbside maintenance access or underground utility maintenance accessibility are not obstructed. Despite this, it is suitable to allocate such cycle parking stands on footways providing the allocation is compliant with the appropriate clearance requirements.

Considerations for cycle parking in the carriageway, on build-outs or on segregating islands include:

- Impact on kerbside access to properties, particularly for deliveries and disabled parking (although the issues are similar for footway cycle parking)
- Impact on informal pedestrian crossing desire lines
- Provision of a buffer space to moving traffic, to allow cycle users safe access and allow for cycles protruding well beyond the stand
- Maintaining access to utilities
- Potential obstruction of drivers' view at junctions or near pedestrian crossings

Figure 4.70: Cycle parking in central median between two trees so does not clutter pedestrian spaces.

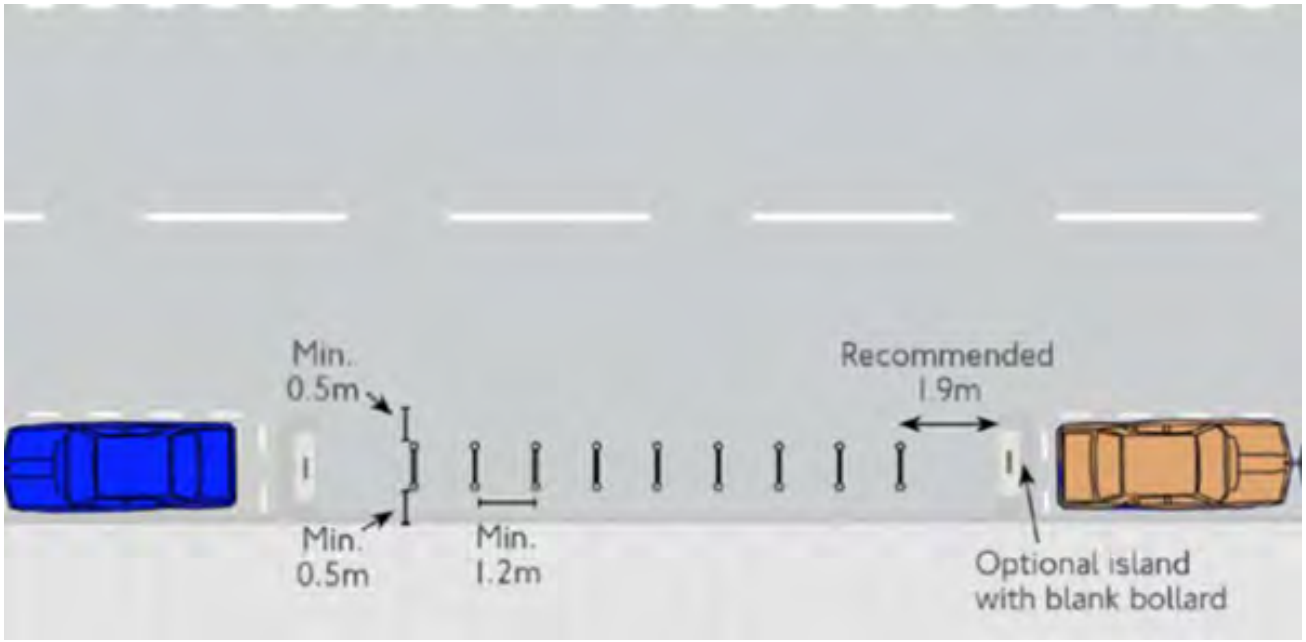


Figure 4.71: Schematic image of layout where car parking can be converted to cycle parking.

The spacing between cycle stands is determined by the orientation in relation to the nearest facility. Where cycle stands are orientated parallel to each other (inclusive of 45 degree angled stands), the desirable minimum spacing should be 1.2m. Where the stands are orientated in line, a 2.5m minimum distance should be maintained between the centres of the cycle stands (it is typical a cycle stand is between 0.7m - 1m wide).

All cycle stands orientated in line should have a minimum clearance of 900mm from the nearest facility i.e. cycle tracks or carriageway. Where the stands are allocated parallel to each other, a minimum 900mm clearance should be maintained from parallel facilities while a 600mm minimum clearance should be maintained from perpendicular facilities.

Where cycle stands are located on the footway, the stands should be allocated away from pedestrians so that the stands are not an obstruction to oncoming pedestrians where a minimum footway width of 2.0m should be maintained.

Cycle stands placed too close to a wall or fence will inhibit two-point locking and consequently the bike may be more likely to fall over. Cycle stands require at least 0.6m clearance to walls, and a clear space of 1.0m in front to enable the bicycle to be wheeled into position.

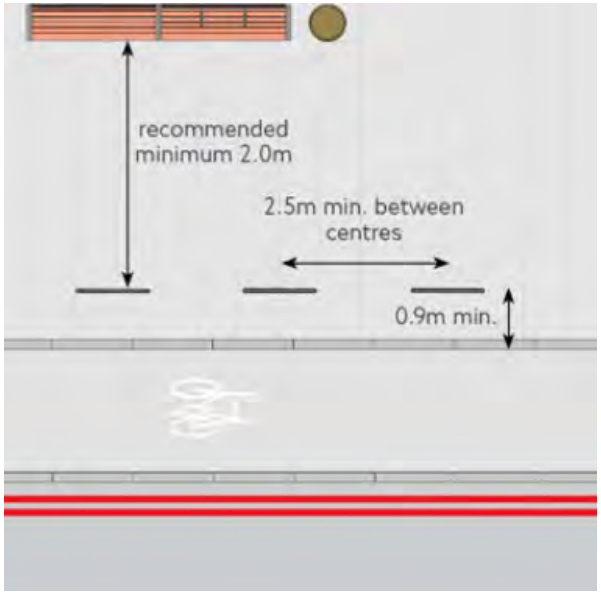


Figure 4.72 Stand placement and orientation layout 1

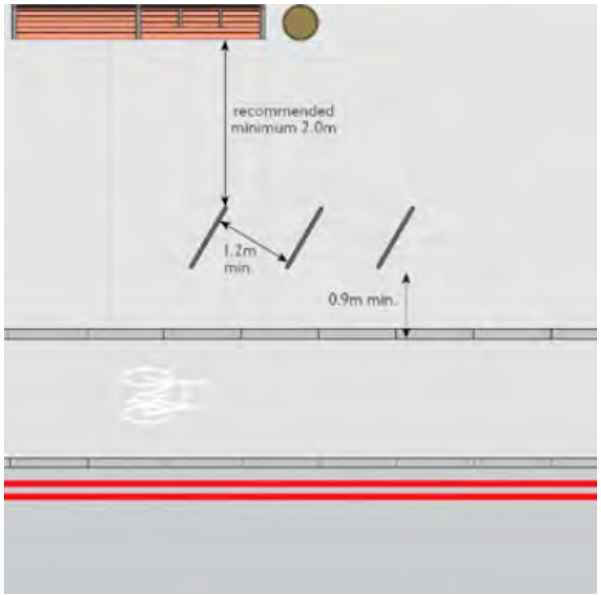


Figure 4.73 Stand placement and orientation layout 2

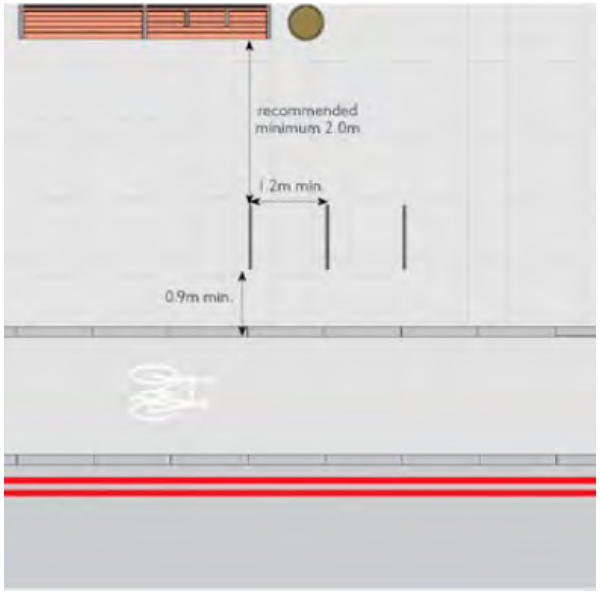


Figure 4.74 Stand placement and orientation layout 3

Figure 4.72-4.74: Options for providing cycle parking layouts while allowing sufficient pedestrian movement space.

Further design information on cycle parking can be found in Cycling by Design, LTN 1/20 and the London Cycling Design Standards.

4.6.3 Mobility Hubs

Introduction to the Concept

Mobility hubs have three main characteristics:

- co-location of public and shared mobility modes
- the reallocation of space from cars and improvement of the surrounding public realm
- a pillar or sign which identifies the space as mobility hub which is part of a wider network and provides travel information

Mobility hubs have many benefits including providing a more convenient, comfortable and safer environment to access a range of sustainable modes. They help to raise the profile of shared mobility services to boost utilisation and viability. In addition, they support low car lifestyles and the reallocation of space from car parking to housing or public realm improvements.[23]

Mobility hubs can also provide a range of services to make travelling via the offered mobility services efficient and convenient. These could include amenities such as storage lockers, shops and cafes, delivery services, which help emphasise mobility hubs as a multi-use space.

Public toilets can also be provided and an example of this is in Portland where public toilets have been installed to respond to the common concerns and problems of public toilet use. These toilets are designed with bars at the top and bottom of the structure as a way to increase the perception of visibility and reduce crime. They are also made of steel with graffiti-proof coating to withstand damage and have a minimalist theme as they do not provide any sinks or mirrors within the structure, instead, a tap is provided outside .

Hubs vary in terms of the scale and facilities provided and can be provided at neighbourhood, city and outer city Park & Ride locations. Examples of hubs that have been provided at these types of locations are shown in the case studies in this section. These examples provide useful ideas and learning for the introduction of mobility hubs in Glasgow.

Neighbourhood Hub: is where there is a lower density of people with higher private car ownership, and the mobility hubs can be designed to address local issues e.g. bike share or secure cycle parking for flats without space for bike storage. The neighbourhood examples show how the hubs could be integrated into local areas as part of the development of Liveable Neighbourhoods in Glasgow.

City Mobility Hub: is where there are high passenger numbers for starting or ending journeys and for transferring between modes. A relevant local example is the existing transport interchange in Partick.

Outer City Park & Ride Hub: locations focus on services which link residents in surrounding areas to core transport networks. This type of hub can also be developed at Park & Ride sites and can include space for car parking. They provide an opportunity to offer greater choice to people for first/last mile trips.[24]

23. https://como.org.uk/shared-mobility/mobility-hubs/what/
24. https://sestran.gov.uk/wp-content/uploads/2020/05/SEStran-Mobility-Hubs-Strategic-Study-Final-Report.pdf

Case study 1: Neighbourhood Hub

Bremen

The City of Bremen in Germany has implemented an integrated mobility strategy which allows for seamless integration between different transportation modes. This strategy promotes mobility on a citywide level through “mobil.punkt” stations, which offer, accessible cycling and walking infrastructure, cycle sharing, public transport across the city and car sharing. These “mobil. punkt” stations implement the concept of mobility hubs on a smaller scale, however, are highly accessible across inner-city neighbourhoods with a station being available at approximately every 300m. The key objectives of the hubs are to provide an alternative to a private car, reduce car ownership, reclaim the street space for people and reduce emissions.

To allow users to transition from public transport, many mobil.punkt stations are located near local public transport stops and cycle racks are provided. Charging infrastructure for e-bikes is also planned. Smartcards are used as the main way to access the services offered at mobil.punkt stations, including providing access to bike storage facilities while to increase uptake of the different modes offered within and near these stations, they offer computer information booths that help users plan their trips.

Figure 4.75: Bremen Mobility Hub with car and cycle sharing co-located.

Figure 4.76: Bremen Mobility Hub with cycle parking located next to public transport stop.

25. https://sustain.ubc.ca/sites/default/files/Sustainability%20Scholars/2018_Sustainability_Scholars/Reports/2018-71%20Identifying%20Best%20Practices%20for%20Mobility%20Hubs_Aono.pdf

Case Study 2: City Hub

Kipling, Ontario, Canada

The Kipling mobility hub includes access to regional and local public transport (bus, rail and subway) services along with safe pedestrian and cycle routes. The development of this mobility hub extends to the entire neighbourhood and the redesign incorporates wider pavements with street furniture and dedicated cycle routes leading to the station. There is space dedicated to covered cycle parking and cycle lockers at the station and the aim is to improve access to the station by bike to increase cycling trips for first and last mile travel.

Figure 4.77: Kipling Mobility hub showing large station with green roof.

Case Study 3: Park & Ride Hub

Park & Ride Haren, the Netherlands[26]

Park & Ride Haren is located on the outskirts of Haren at the exit of the A28. There are city buses to Groningen, a regional bus service to Assen and Qliners and bus services to Delfzijl, Groningen, Annen, Gieten and Assen. This hub consists of two bus stops with a canopy. The hub also has cycle stands, secure cycle lockers and real-time information. Planned additional facilities include charging points, a water tap and Wi-Fi.

Figure 4.78: Large numbers of covered cycle parking at a park and ride in Netherlands.

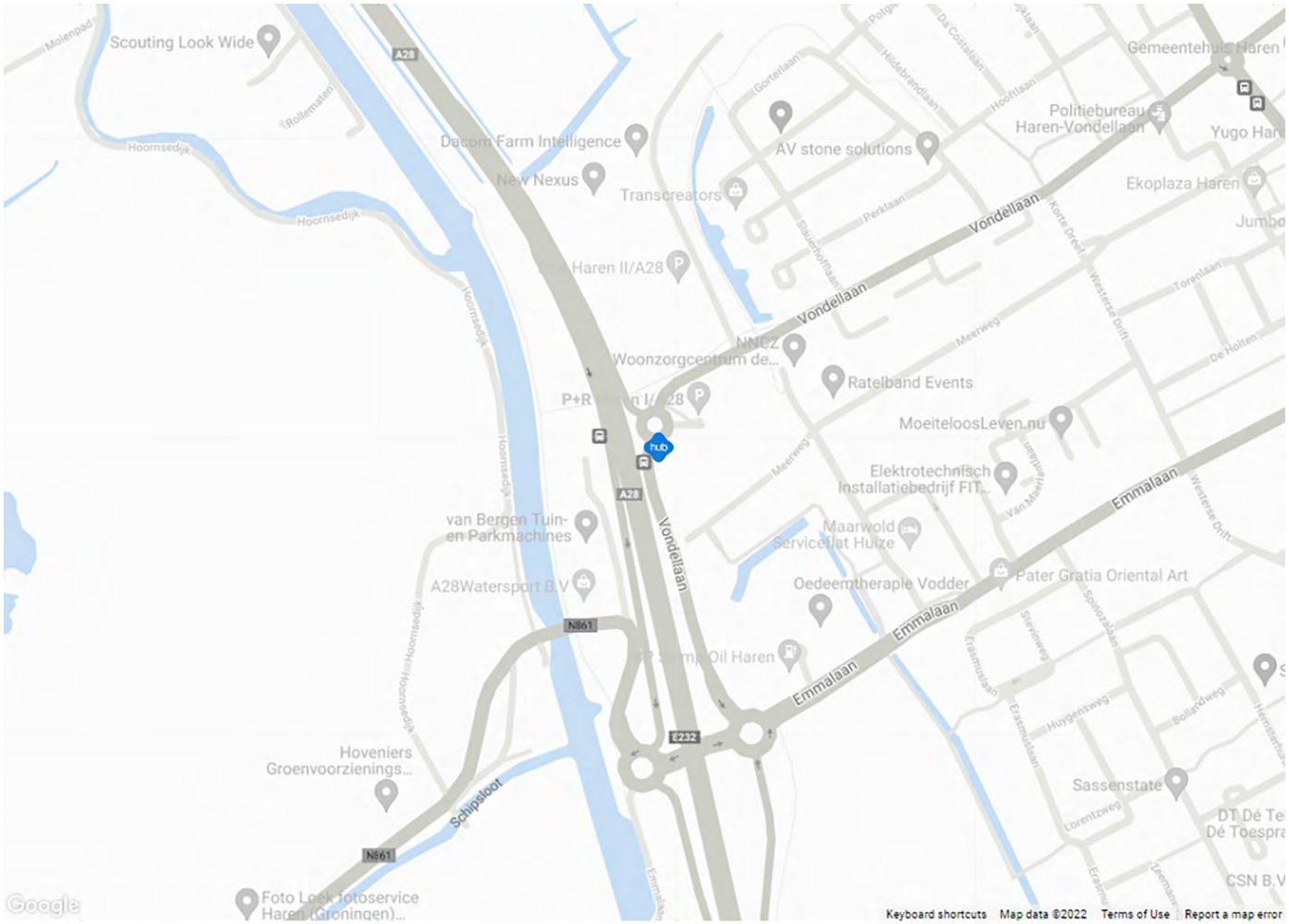


Figure 4.79: Map of location of park and ride at Haren in Netherlands, park and ride is location between motorway and built up area.

26. https://www.reisviahub.nl/hubs/haren-p-r-a28/

4.6.4 Wayfinding and Network Identity

Introduction to the Concept

The following wayfinding principles were established in a Transport for London study:

Journey Planning Information

Should offer complete routes with clear information and journey type options

Safety hot spots should be clearly marked with alternative options available

On-street Signage

- Should stand out and be easily identifiable
- Cyclists should not be required to stop often, interrupting their journey
- Clear instructions are required, especially where space is shared with pedestrians
- Cyclists need regular reassurance that they are on the right route, and in the safest position
- Areas which are dangerous to cyclists require advance warning and alternative suggestions

On-street Maps

- Should have an optimal amount of detail to assess safety conditions at a large scale
- The most relevant landmarks for cycling should be clearly marked to aid orientation

Other On-street Signage

- Should be consistent and easy to identify as belonging to a single system.
- Cyclists require regular confirmation of their route.
- Different signage types can link together as part of a larger system.
- Distances are important information for cyclists.

Temporary and Digital Information

- Should be used to highlight disruptions and dangers to cyclists, with suggestions for safer routes

Figure 4.80: Person stop on protected cycleway and using their phone to check directions.

Case Studies

Wayfinding

Major investments in wayfinding strategies can be seen in London through their Legible London programme. The main objectives were to help residents and visitors walk to their destinations quickly and easily by offering a consistent experience and proving information about distance between areas.

A key aspect of the success of the wayfinding strategy was integration with other sustainable transport modes such that when people exit tube or bus stations, they can quickly identify the route to their destination.

Other wayfinding programmes such as Frome Bikeway in Adelaide, Australia, have created wayfinding features which reduce sign clutter by introducing markings1

Figure 4.81: Collection of images of protected cycleway in Adelaide Australia.

Design Requirements

Pedestrian and cyclist signage and wayfinding should always incorporate the smallest practicable plate size in accordance with the options and guidance within Traffic Signs Regulations & General Directions (TSRGD).

Direction signage for pedestrians and cyclists, the plate size should be minimised by utilising a 25mm x-height. A larger text x-height should be allocated when the viewing distance exceeds 30m and in this case, an x-height of 30mm would be appropriate (TSRGD).

Opportunities to reduce street clutter should be considered. The use of existing poles and columns along the route should be strongly encouraged.

Sustrans guidance outlines their support in creating a 'route identity'. This encourages community participation and ownership. The creation of a branded route through the use of logos on signage and street furniture is strongly encouraged when combined with the highway TSRGD prescribed signage and wayfinding.

Route Identity

Creating a route identity is an important element of a cohesive cycling and walking network and can be helpful in encouraging community involvement and ownership. Where a route takes on an identity, it can then be used to create a brand.

The resulting brand can then be applied to features along the route, such as signing and street furniture. Examples of branded routes include The Way of the Roses, The Caledonia Way and The Nickey Line. *Figure 4.81* shows an example from the Caledonian Way.

Figure 4.82: Blue branded national cycle network direction sign.

One of the key considerations to ensure the most effective use of wayfinding features and signage is their location. They should be located where users start their journeys, at key decision points and landmark destinations.

Pedestrian and cyclist signage and wayfinding should always incorporate the smallest practicable plate size in accordance with the options and guidance within Traffic Signs Regulations & General Directions (TSRGD).

Direction signage for pedestrians and cyclists, the plate size should be minimised by utilising a 25mm x-height. A larger text x-height should be allocated when the viewing distance exceeds 30m and in this case, an x-height of 30mm would be appropriate (TSRGD).

Opportunities to reduce street clutter should be considered. Signs must be demonstrated to be absolutely necessary before being installed. Where signs are installed, they should be co-located onto a single pole where possible. Double poles should be avoided where possible. The use of existing poles and columns along the route should be strongly encouraged.

Fingerpost signs may be used in particularly complex urban environments, but map-based products are to be prioritised over fingerposts (for pedestrians).

Fingerslats can be installed on existing lamp columns where possible. Designers should ensure that the sign allows for a minimum clearance of 450mm away from the kerb edge for any part of the sign, including the fingers. This can mean that the pole for the sign needs to be mounted more than 1,000mm from the kerb edge, which will not be appropriate in many situations.

Sustrans guidance outlines their support in creating a 'route identity'. This encourages community participation and ownership. The creation of a branded route through the use of logos on signage and street furniture is strongly encouraged when combined with the highway TSRGD prescribed signage and wayfinding.

For additional design requirements in relation to pedestrian/cyclist signage refer to the Traffic Signs Manual, TSRGD and the GCC Public Realm Design and Maintenance Guide.

Figure 4.83: Bollard with small blue sign to denote shared use path.

Signage indicating a shared cycle footway, should be discrete and informativ.e

Figure 4.84: Partially pedestrianised high street but with no clear signage.

The lack of traffic signs and markings is designed to promote slower speeds and improve pedestrian environment, but needs considered implementation to ensure clear demarcation to all between different spaces.

5

Proposed Initial Delivery Plan

Proposed Initial Delivery Plan: City and Neighbourhood Networks

5.1 Neighbourhood Network

The Liveable Neighbourhood Plan (LNP) has been developed in response to the Scotland's 2045 – Fourth National Planning Framework Draft (Nov 2021) identifying ***Liveable Places*** and the ***20 Minute Neighbourhood*** approach as being the key development opportunity that would influence the way we plan places together with everyday local infrastructure to significantly reduce the need to travel.

The Council has recognised that a strategic approach to design and delivery is required to extend to all areas of the city. The LNP provides an opportunity for such a framework to be developed. Therefore the LNP approach for Glasgow is based on implementation at the scale of large urban neighbourhood areas. The process will be led with public participation helping to identify a series of thematic interventions in their local communities, whilst also delivering on the necessary city scale interventions required. Improving walking and public realm at the neighbourhood level will require a significant number of different scale interventions that typically don't suit top-down planning. The Liveable Neighbourhoods Plan (LNP) is a 10-year programme that will focus on enabling communities and people of all abilities to improve their neighbourhoods.

The LNP focuses on identifying existing projects and proposing new interventions through community engagement which will bring forward improved physical change in neighbourhoods. The LNP will empower communities to collaborate with the council in taking a place-based approach to reallocating space to people and make it easier for people to make their everyday journeys through walking, wheeling, and cycling.

The LNP will be complimentary to City Network in that it will provide an accessible neighbourhood network connected to a comprehensive City Network. Together this offers a series streets and spaces that will be transformed to provide significant contribution to sustainable transport choices and carbon reduction. Cross referencing the Place Standard tool with the common attributes of a 20 Minute Neighbourhood we have identified 4 key thematics. These are:

Local Town Centres: Local centres enable communities to meet their everyday needs locally and bring vibrancy, activity and jobs.

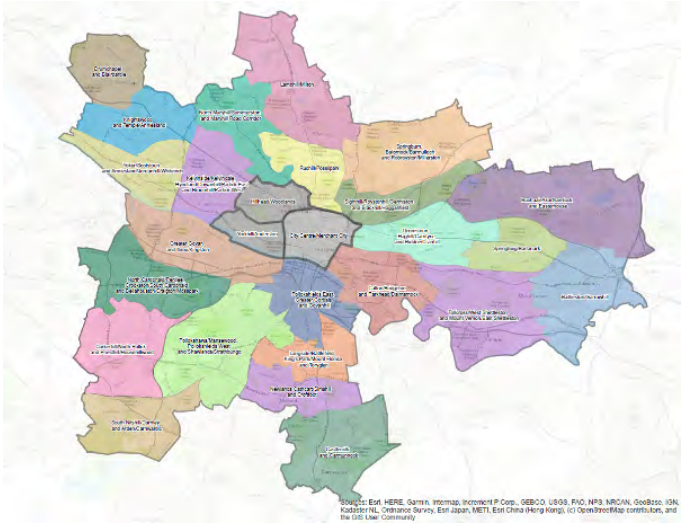


Figure 5.1: Map of different Liveable Neighbourhood delivery areas in Glasgow.

Everyday Journeys: Improving the quality of journeys undertaken as part of everyday life e.g. the daily commute; the 'school run' or the daily shop.

Active Travel: Ensuring support for active travel within neighbourhoods and connecting them to the *City Network.*

Streets for People: Promoting a better balance between vehicles and people by working with local communities.

The LNP is currently in the first year and has conducted initial engagement and project identification with communities in the five areas included in Tranche 1: Ruchill to Possilpark LN; Dennistoun to Cranhill LN; Greater Govan to Kingston LN; Langside to Toryglen LN; and Yorkhill to Anderston LN. The LNP is set out so that within five years the first three tranche areas will be underway and the fourth tranche about to begin.

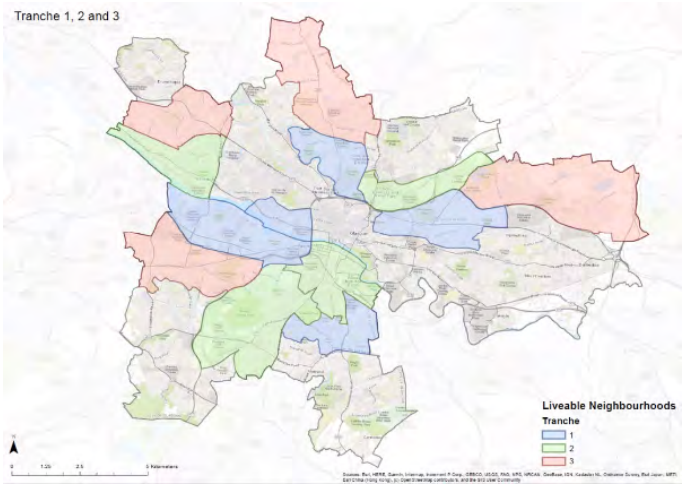


Figure 5.2: Map of first three delivery tranches for Liveable Neighbourhood Plan.

The below shows general outlines of how the tranches for Liveable Neighbourhoods will go from initial community conversations to delivery. Each Tranche is expected to be created, designed, and delivered over an approximate five-year timetable utilising the internationally recognised Royal Institute of British Architects (RIBA) plan of work. The RIBA Plan of Work organises the process of briefing, designing, constructing and operating projects into eight stages. The RIBA Stages are:

RIBA Stage 0. Strategic Definition
1. Preparation and Briefing
2. Concept Design
3. Developed Design
4. Technical Design
5. Construction
6. Handover
7. Use

LNP Tranches	2021/ 2022	2022/ 2023	2023	2024	2025	2026	2027	2028	2029	2030
Tranche 1	RIBA 0-2	RIBA 3-4	RIBA 5-7	RIBA 5-7	RIBA 5-7					
Tranche 2		RIBA 0-2	RIBA 3-4	RIBA 5-7	RIBA 5-7	RIBA 5-7				
Tranche 3			RIBA 0-2	RIBA 3-4	RIBA 5-7	RIBA 5-7	RIBA 5-7			
Tranche 4				RIBA 0-2	RIBA 3-4	RIBA 5-7	RIBA 5-7	RIBA 5-7		
Tranche 5					RIBA 0-2	RIBA 3-4	RIBA 5-7	RIBA 5-7	RIBA 5-7	
Tranche 6						RIBA 0-1	RIBA 3-4	RIBA 5-7	RIBA 5-7	RIBA 5-7

5.2 City Network

The Long Term Vision

The City Network was presented in the Active Travel Strategy Consultation and presents the concept of a dense to be delivered over the next ten years. The City Network compromises of approximately 280km of routes on a wide variety of street contexts including busy bus corridors, bustling high streets, wide tree-lined boulevards, and space constrained closely built streets.

Figure 5.3: Small map of proposed City Network for active travel in Glasgow.

Although the City Network spatial planning scales are for cycling, the delivery must improve the pedestrian environment alongside introducing cycle infrastructure. Victoria Road and Garscube Road are good examples of projects which introduced protected cycleways alongside revamped footways, new pedestrian crossings, and public realm additions such as benches and trees.

The City Network will enable modal shift by providing people with high quality infrastructure that keeps them safe from motor traffic and provides a smooth, direct, and comfortable journey.

- Enable direct clear active journeys to everywhere in Glasgow for everyone in Glasgow (e.g., ages 8 to beyond 80)
- Eliminate traffic danger as a reason not to cycle.
- Improve ability of Glasgow's road network to enable movement of people and goods.
- Be usable all year round.
- Encourage demographic use which is representative of Glasgow (e.g., 50% women).
- Provide easy access to Glasgow's green network of canals, rivers, parks, and old railways.

Initial Delivery Outline

The City Network is a ten-year programme but will be most successful if "network benefits" can be realised early on. Such networks benefits are when proportionally more people are cycling than on a single route because a network enables many different journeys to take place and offers flexibility on the journey. 70% of respondents to the Active Travel Strategy survey agree with the premise of "prioritise connecting the existing infrastructure to initially create localised networks which can then be expanded to the whole city."

In order to achieve the City Network then design and delivery needs to be sustainably ramped over a ten-year period. Here, we set out a vision for producing an initial network over five years. This initial network aims to offer the best balance between coverage, density, deliverability, and functionality by

- Targeting the creation of networks in places
- Building on existing infrastructure and Spaces for People
- Accelerating projects in currently in planning stages
- Ensuring access to wide range of destinations across Glasgow.

A possible Initial Network concept is presented in the following pages with eight concept example projects form the above criteria. It is likely that delivery will have significant cross over between these projects and that other routes could be delivered first that aren't highlighted here as more detailed analysis presents other opportunities to deliver on the desired outcomes.

North Glasgow City Network

The proposed North City Network is primarily constructed of routes proposed as part of the “North City Way” project which did extensive consultation and engagement in the area and progressed the project to RIBA stage 2.

It consists of approximately 9.6 km of infrastructure, 3.6 km of which is currently Spaces for People routes. There are nine significant junctions which would require protected treatment. The Liveable Neighbourhoods programme identified a series of accompanying traffic calming and placemaking measures in the surrounding Possilpark and Ruchill neighbourhoods.

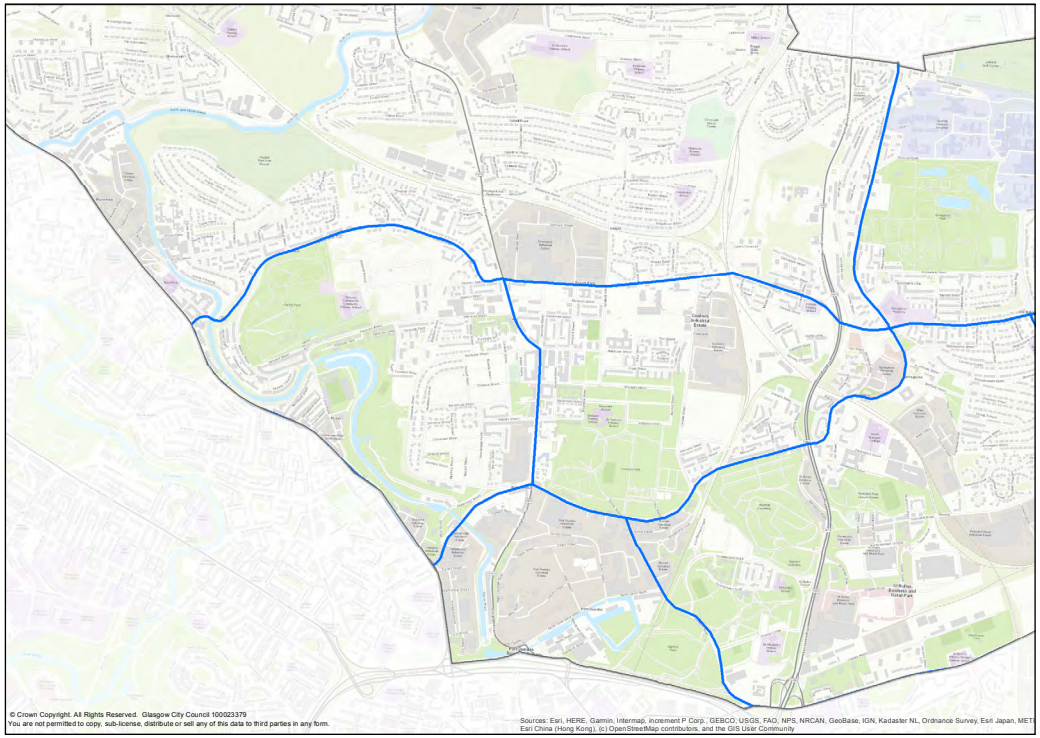


Figure 5.4: Schematic Map showing possible locations of the City Network to be prioritised in the North of Glasgow.

North East City Network

The proposed North East City Network is primarily constructed of routes delivered as Spaces for People or earlier equivalent style infrastructure. This network will allow connection from Robroyston, Blackhill, and surrounding areas into the North City Network. This will enable direct cycle routes into Glasgow City Centre and potentially all the way to QEUH once Govan Bridge and other connections are made.

It consists of approximately 9.8 km of infrastructure, approximately 5.5 km of which is currently Spaces for People routes. There are nine significant junctions which would require protected treatment. These areas are planned for Tranche 2 and 5 of the Liveable Neighbourhoods Plan.

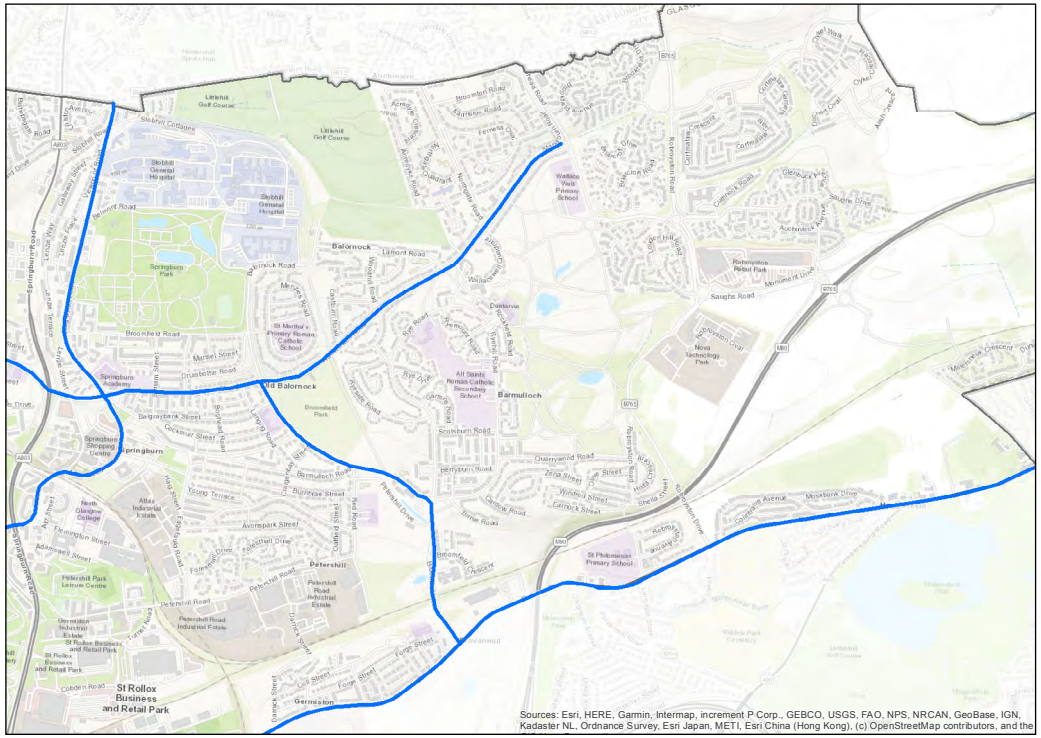


Figure 5.5: Schematic Map showing possible locations of the City Network to be prioritised in the North East of Glasgow.

Connecting West End

Connecting West End has several routes which are at RIBA Stage 4 as part of City Deal funding and the Connecting Woodside project. This network would allow a large-scale functional network to be constructed if connected to the North City Network. This would enable significantly enhanced access for more people to education and employment opportunities.

Connecting West End consists of 11 km of infrastructure, approximately 5 km of which is at advanced stage to be delivered under other programmes. The remaining routes do involve treatment at significantly large junctions. Five or more Low Traffic Neighbourhood treatments may also be required to be delivered alongside City Network infrastructure. This area is at Tranche 6 of the Liveable Neighbourhoods Plan.

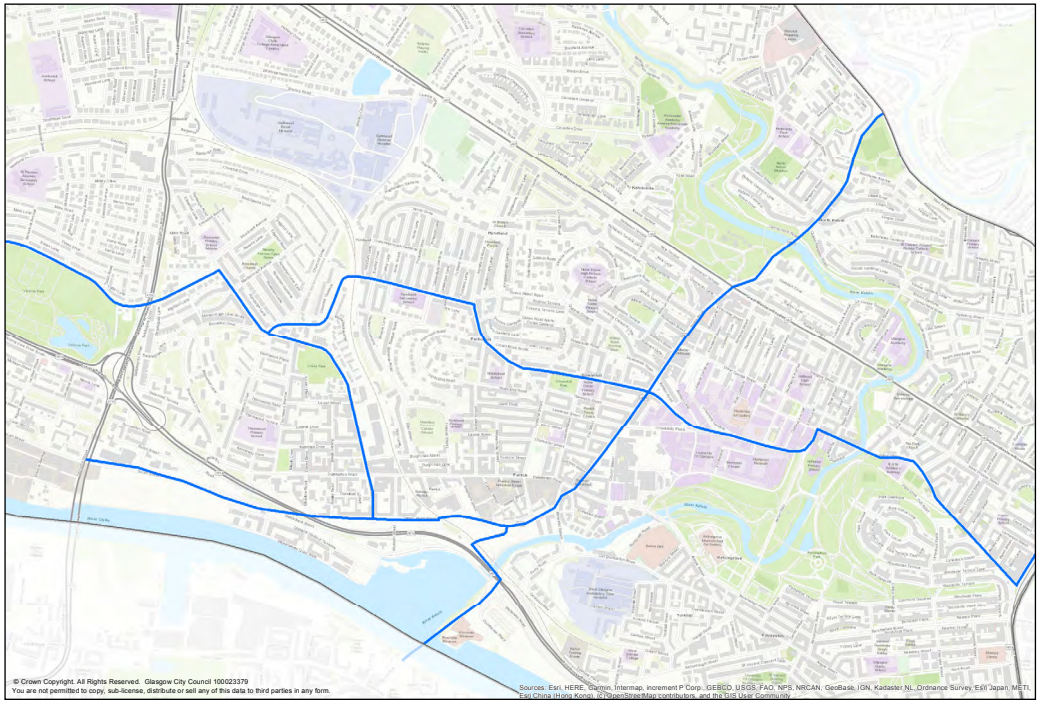


Figure 5.6: Schematic Map showing possible locations of the City Network to be prioritised in the West End of Glasgow.

Connecting Knightswood

Connecting Knightswood establishes the City Network in the west of Glasgow independent of any potential Sustainable Transport Corridor developments on Dumbarton Road or Great Western Road. The proposed Cycle Street connection along Danes Drive enables us to test the attractiveness of this type of cycle infrastructure for enabling mode shift. The largest technical challenge is likely the connection with the “Connecting West End” project across Crow Road.

Connecting Knightswood consists of 9km of infrastructure of which 4-5km is delivered as Spaces for People or past outdated cycle infrastructure. Low Traffic Neighbourhood Style treatment may be needed around the proposed Cycle Street Connection. Knightswood is delivered under LNP as part of tranches 2-3 which will investigate traffic filtering alongside city network proposals.

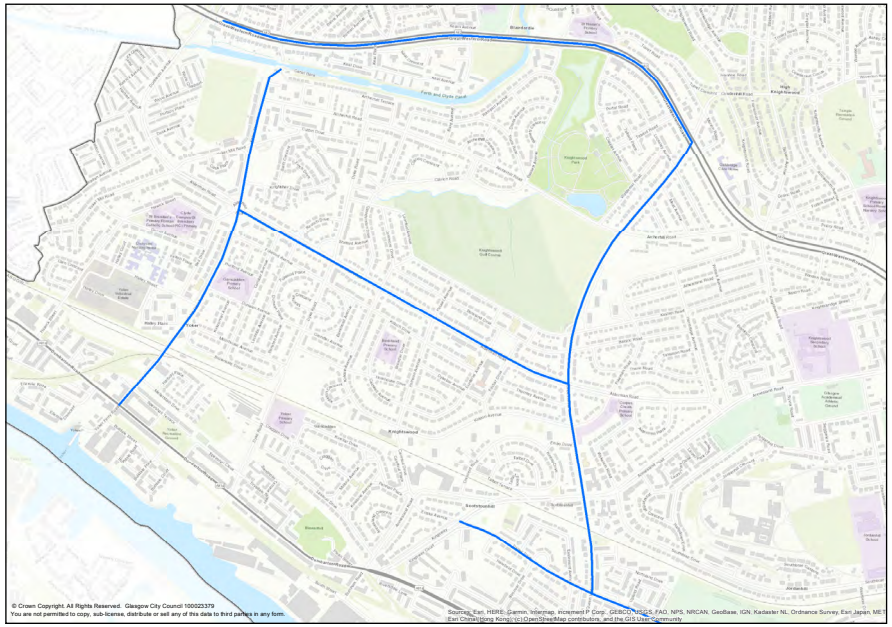


Figure 5.7: Schematic Map showing possible locations of the City Network to be prioritised in the Knightstwood and Scotstoun areas of Glasgow.

QEUH-Govan Network

QEUH-Govan establishes the City Network in the south west of Glasgow and builds on the Govan-Partick bridge connection as well as proposals to revamp the pedestrian-cycle routes through the Clyde Tunnel. Vital connections to the wider City Network are enabled to the Queen Elizabeth University Hospital which is a major destination.

The QEUH-Govan network also takes in Shieldhall Road which will provide vital active travel connections to Renfrew and Braehead shopping centre. QEUH-Govan Network consists of 8.4km of infrastructure of which some is in place around Water Row which will connect with the Govan-Partick bridge. Parts of the area are already Low Traffic Neighbourhoods but there is opportunity to deliver several more alongside the city network.

Connecting Pollok

Connecting Pollok is set out to transition the Spaces for People infrastructure in Pollok to high quality permanent treatment while connecting these sections to the wider City Network around Govan.

The proposals call for an upgrading of the pedestrian bridge across Levern Water as well as enhancing the public realm through a motorway underpass to make these routes inviting and accessible.

Connecting Pollok consists of 6.0km of infrastructure of which 3.0km is currently delivered as Spaces for People Infrastructure. Many of the junctions are currently significantly sized roundabouts and there is potential to use access roads on some links.

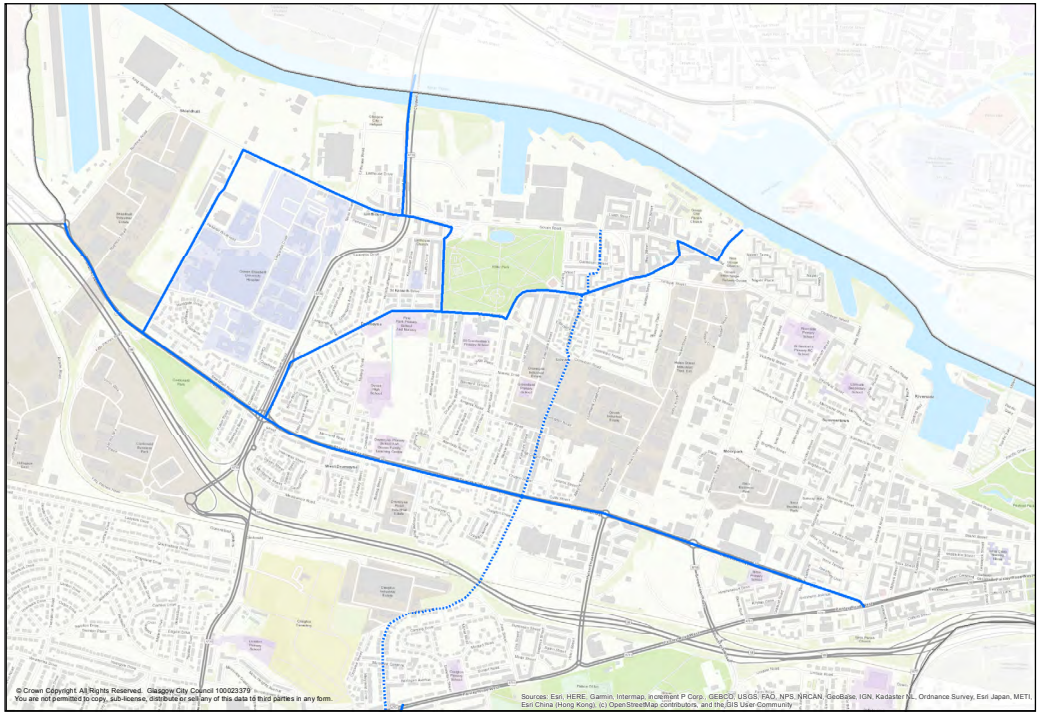


Figure 5.8: Schematic Map showing possible locations of the City Network to be prioritised in the Govan and Linthouse area of Glasgow.

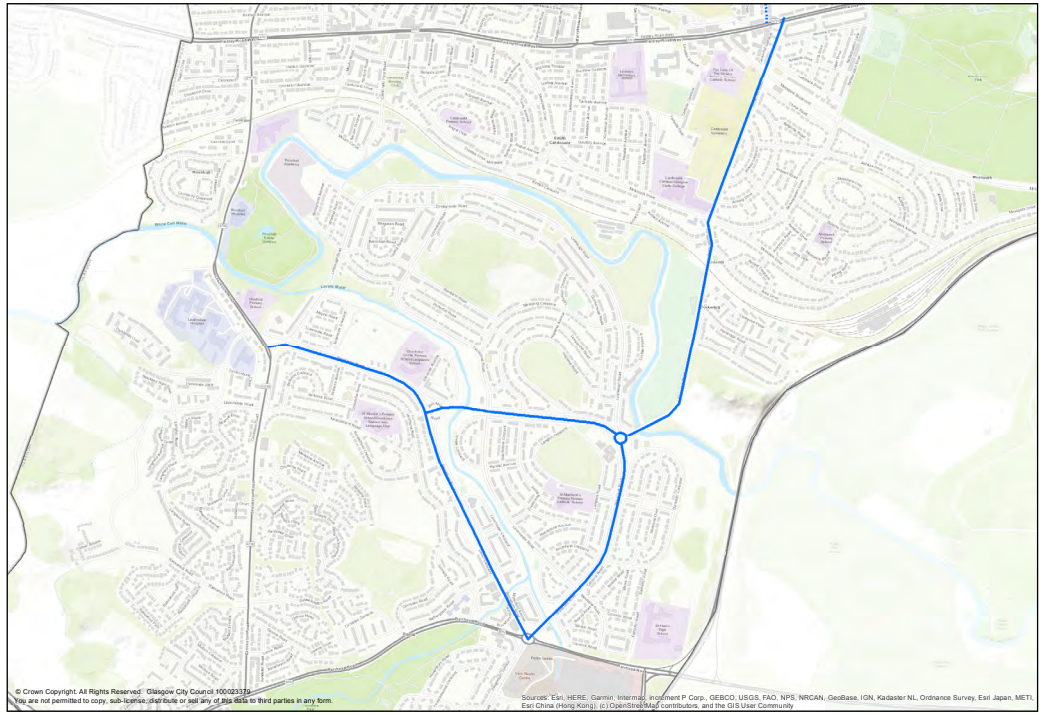


Figure 5.9: Schematic Map showing possible locations of the City Network to be prioritised around Pollok.

South Glasgow City Network

The South Glasgow network aims to build on the existing quality infrastructure of the South West City Way and South City Way by extending and connecting these routes. Continuing the South City Way to Clarkston Road enables a contiguous route from Clarkston (East Renfrewshire) to the city centre potentially enabling significant commute modal shift.

The nature of the street layouts in the south of Glasgow enables cycle street concepts to be explored. This is where safe cycling and improved walking environments are created primarily through the reduction and calming of traffic.

South Glasgow network consists of around 14.4km of routes with a significant number of space constrained junctions.

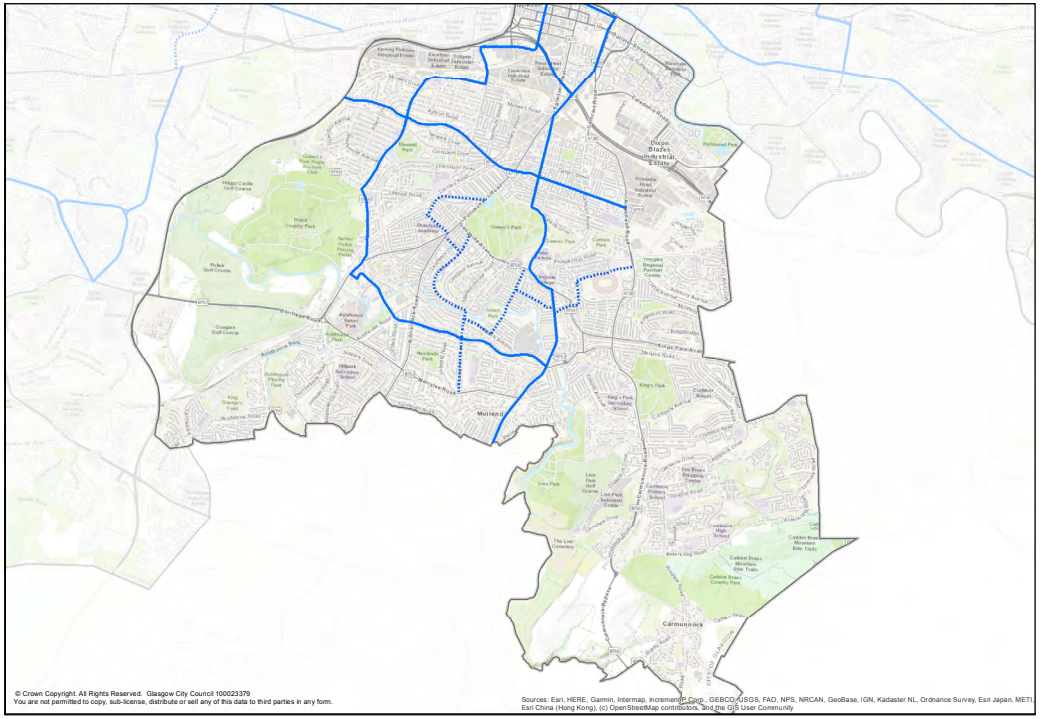


Figure 5.10: Schematic Map showing possible locations of the South Glasgow City Network to be prioritised in the South of Glasgow.

East Glasgow City Network

The East Glasgow network is made possible through the current delivery of the East City Way along London Road. The proposals here are to build on that route to provide extra connectivity to other parts of Glasgow and use East City way as a model for Edinburgh Road and Cumbernauld Road. Both Edinburgh Road and Cumbernauld Road are wide streets creating severance between neighbourhoods.

The East City network consists of around 22.1km of infrastructure, of which approximately 8.7km is currently being developed as part of the East City Way.

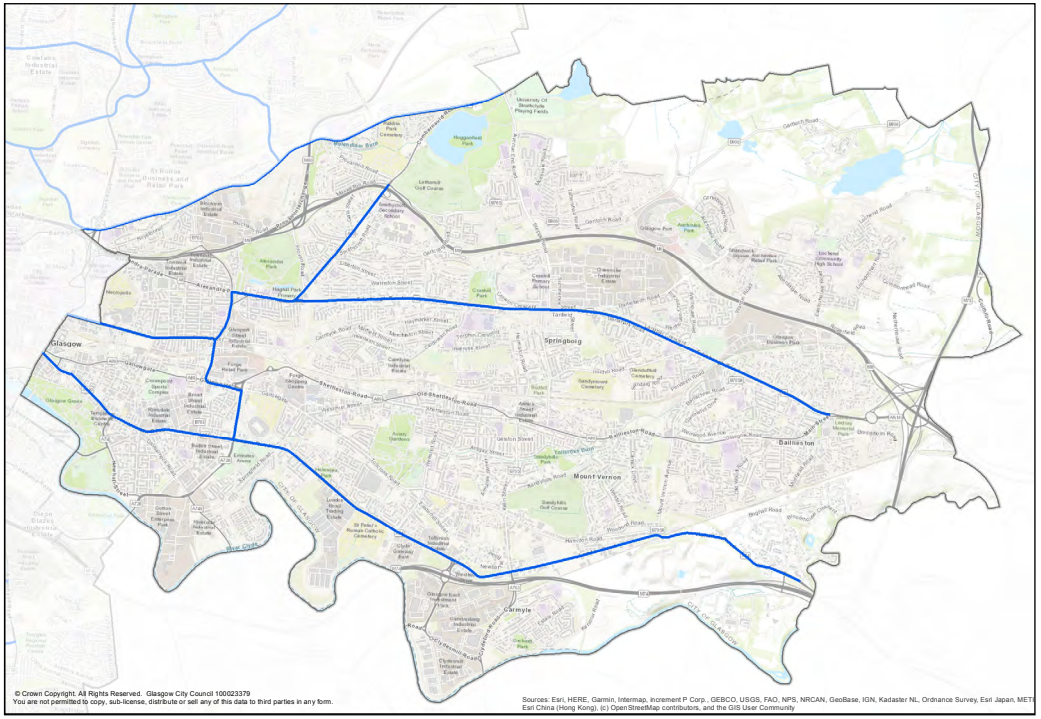


Figure 5.11: Schematic Map showing possible locations of the City Network to be prioritised in the East End of Glasgow.

Initial Network Overview

The extent of the City Network if all these projects were delivered across Glasgow is shown in the map opposite. This network would represent over a 1/3 of the total proposed city network routes but connect in to more than half of Glasgow schools. Such a network would represent the most comprehensive active travel infrastructure offering across a city in Scotland which would provide a solid framework for expansion to deliver the rest of the City Network within ten years.

- Proposed new routes 60.4 km
- Existing 14.5 km
- Cycle Streets 14.9 km
- SfP 19.3 km
- Total 109.1 km
- Total number of schools within 400m 93/173

These figures and the map do not show the five main roads being funded and developed under the Bus Partnership which aims to reduce bus journey times by 20% and increase journey time reliability. The routes being investigated by the Bus Partnership are Maryhill Road, Great Western Road, Dumbarton Road, Paisley Road West, and the A77. Although focussed on bus, these routes would also be delivering for active travel and delivery the high-quality cycle infrastructure and pedestrian environments envisioned by the City Network.

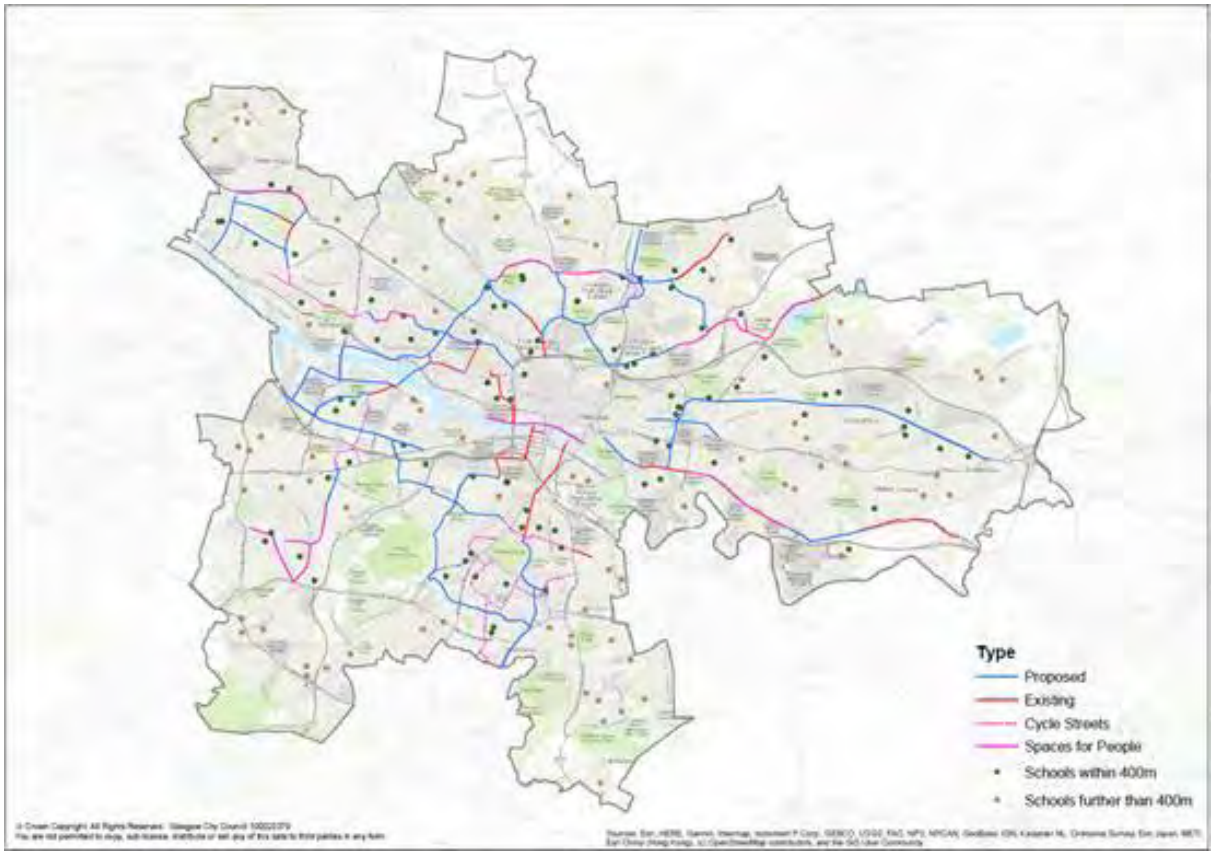


Figure 5.12: Map of potential prioritised projects of City Network across Glasgow showing proximity to schools.

City Network Prioritisation

The city network must be delivered in a logical consistent manner with clear justification for prioritising certain areas. During the consultation period for the active travel strategy there were many conversations and feedback on how to prioritise the city network. Generally, people wanted to see upgrading of what was delivered under Spaces for People, connections of existing routes to a wider network, ensuring low-income areas had access to the network, delivering modal shift, as well as considering road safety as an important factor for infrastructure.

Glasgow City Council will always strive to deliver innovative sustainable transport projects which deliver and, where possible, exceed best practice and meet national standards. In doing so, the council will ensure that safety and risk are appropriately managed.

In exceptional circumstances where national standards cannot be met, officers will use their training and experience to find innovative solutions which best support the council's aims and ambitions.

Glasgow City Council will ensure that projects are developed in full engagement and consultation with communities and key stakeholders and that they influence our outcomes.

We are proposing the following prioritisation principles:

- **SociallyJust:** ensure low-income areas of Glasgow are part of the growing network.
- **Network in Place:** build on existing and Spaces for People routes to quickly deliver localised network which can be expanded upon.
- **Modal Shift:** enable more people to choose active travel for everyday journeys.
- **Access:** ensure routes provide access to destinations such as schools and medical centres.
- **Liveable Neighbourhoods:** City Network Projects outlined and co-created as part of the Liveable Neighbourhoods process

Projects within the City Network will likely need to be prioritised even with consistent funding over ten years. Such political prioritisation decisions should be taken strategically with overarching views of the aims of the City Network as well as other transport and city project such as Metro+ and bus improvements. There are existing data sources which can be used to help inform prioritisation decisions based on the above principles:

Socially Just: SIMD data can be used to ensure that projects prioritised do not inadvertently bias towards wealthier areas of Glasgow. Providing better low-cost connections from low-income areas to jobs and facilities can help tackle income exclusion across Glasgow.

Figure 5.13: Map of Glasgow showing Scottish index of multiple deprivation.

Network in Place: by targeting areas with infrastructure and Spaces for People routes then network benefits can be quickly realised. Such network prioritisation also allows lessons to be learned early on about modal shift to cycling from other modes in Glasgow as well as support that different people might need to make use of the new infrastructure.

Modal Shift: modelling tools, such as the Propensity to Cycle Tools, collates a range of data informing which areas could lead to larger modal shift.

Access: routes can be scored according to destinations such as healthcare, parks, schools which will inform how different City Network projects can enable access to city services and destinations.

Figure 5.14: Map of proposed city network with colours showing examples of how routes may be prioritised based on proximity to key locations.

Liveable Neighbourhoods: other aspects can be considered to inform prioritisation. An example is coinciding the rollout of the City Network with the delivery tranches of Liveable Neighbourhoods. Such an approach could enable maximum benefits to be realised early on by combining Neighbourhood Network and City Network. Lessons on the interaction between the two would also be fed into later delivery providing more confidence and chances of success.

The above factors, and others such as potential road safety benefits, can then be collated to inform strategic decisions on City Network delivery prioritisation. The below table is an example of how such information can be presented where green represents “strongly contributes to” yellow “contributes to” and red “no significant contribution”. Numerical scores can be attached to each category with different weightings depending on priorities.

Figure 5.15: Map of Glasgow showing proposed City Network overlaid over first three Liveable Neighbourhood tranches.

Associated Low Traffic Neighbourhoods

One of the repeated pieces of feedback received during the Active Travel Strategy Consultation was that some current cycleways in Glasgow feel uncomfortable or dangerous at side street junctions. A significant factor in the feeling of unsafety is the volume and speed of turning traffic at side street junctions, which also creates a poor pedestrian environment.

“Several junctions along the South City Way feel very dangerous to traverse as a cyclist. I feel unsafe every time I approach them. Many times, I have had to make an emergency stop as a driver swings round one of these corners without stopping. On what is an otherwise fantastic route.”

“Drivers are beginning to learn about priority at these junctions but it’s still not usable by children.”

To mitigate such barriers to using the cycleway in the future, then City Network will be rolled out with accompanying side street filtering which can be applied on an individual case or strategically to create surrounding Low Traffic Neighbourhoods. A Low Traffic Neighbourhood is a neighbourhood traffic circulation plan where vehicular access to properties is from one boundary road only. A boundary road is generally defined as a main road which forms the boundary of a neighbourhood.

Some LTN areas are clearly defined by existing main roads, but others will need engagement as part of the Liveable Neighbourhood Plan to identify boundary roads.

LTNs are best delivered through an initial 6-month trial with moveable planters which allow the plan to be tweaked if unexpected negative outcomes emerge. An example of negative outcome is through traffic displaced to street which can’t accommodate it successfully, i.e., another neighbourhood street rather than main road.

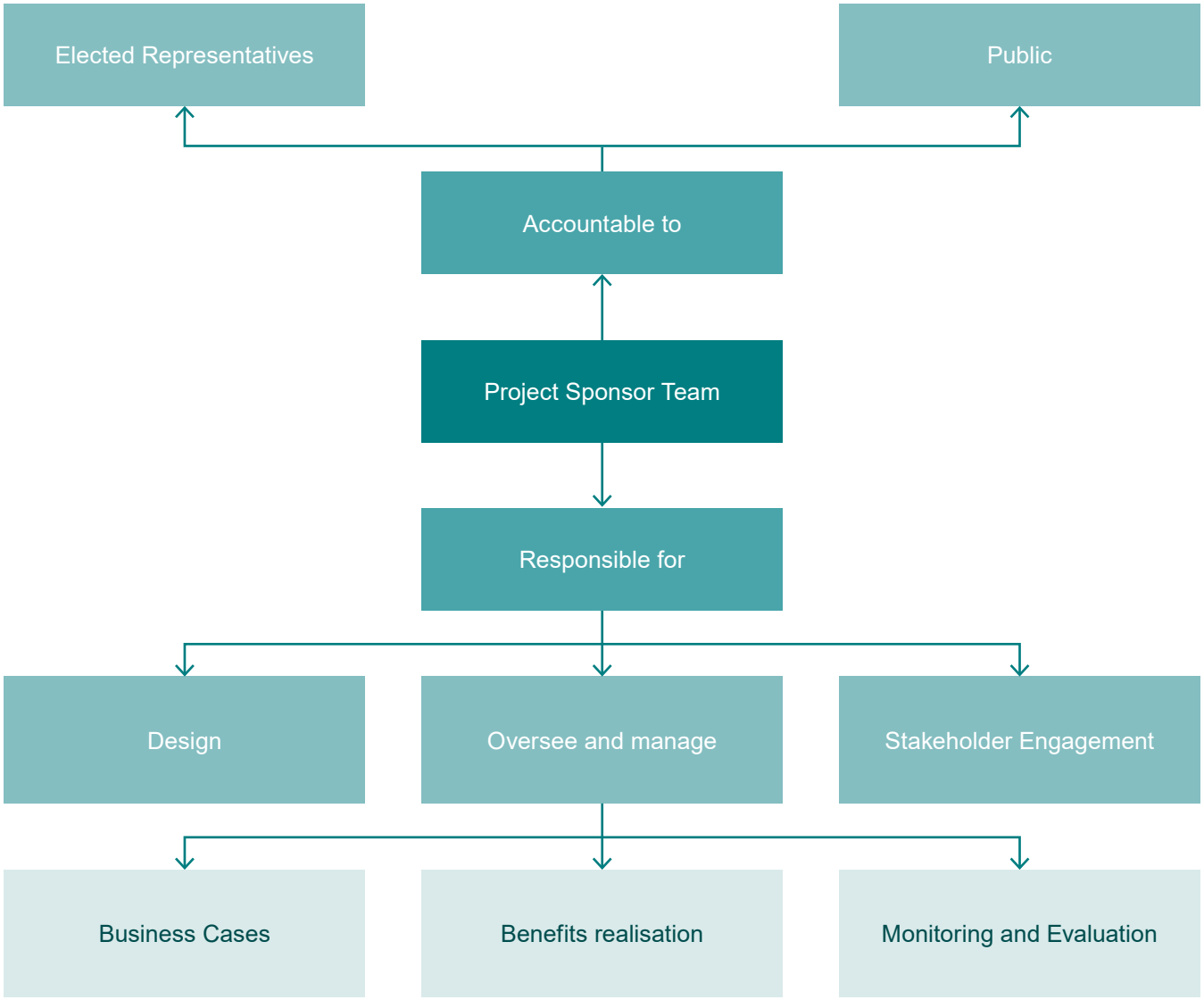
- Pre-trial
  - community engagement to determine boundary roads, filter locations and baseline monitoring
  - Targeted conversations with groups or people identified through Equality Impact Assessment processes
  - Engagement with emergency services
  - Communicate changes to mapping companies
  - Set aims and targets of trial
- Trial (6 months duration)
  - Set up low traffic neighbourhood with moveable objects such as planters
  - Traffic monitoring on key neighbourhood and boundary roads
  - Targeted delivery of walking measures such as pavements improvements and dropped kerb installation
  - Continue engagement and conversations with communities
  - Adjust if necessary
- Post-trial Review
  - Did LTN progress towards aims?
  - Were unexpected downsides experienced?
  - Proceed to permanent design?
- Progress to permanent design
  - Community engagement to build community space into filters and other Liveable Neighbourhood Projects.

Governance Structures

Effective governance structures are highlighted as key in the International Cycling Infrastructure Best Practice Study Report for Transport for London. The report sets out that cities with comparable governance systems to London (i.e., with a strong strategic authority able to lead by example on its own highways, and to appropriately influence the boroughs through that leadership) seem to have the best structure for improving conditions for cycling. Although focussed on cycling, the same is true for all active travel.

Funding at an increased level for active travel leading to consistently high-quality delivery and design requires an associated update of governance structures. The importance of establishing the correct governance structures for the City Network should not be underestimated. This is the first time in the UK that such an extensive active travel network is proposed to be delivered in one city. The economic scale of the project is akin to larger infrastructure, such as rail, but is not limited to just one line, location, or urban context.

A possible governance structure is the setting up of a specific project sponsor team that has the depth of expertise to oversee and manage delivery through different project stages. This team would be politically and publicly accountable for delivery and quality.



Schematic showing possible project governance structure to enhance public and political accountability during delivery.

Key Project Risks

This document sets out the vision of what should be delivered in Glasgow to support significant increases in active travel over the next ten years while providing safer environments. A number of factors need to be brought successfully together in order to achieve this vision, both at city and national level.

Funding: major active travel projects have previously been funded through individual bidding programmes. Such funding allocation makes large scale programme delivery challenging and can prevent sustainable ramping up in staff resources to deliver. Furthermore, national funding has a range of priorities and projects to fund and may not provide funding for as quick as roll-out as envisioned in this document.

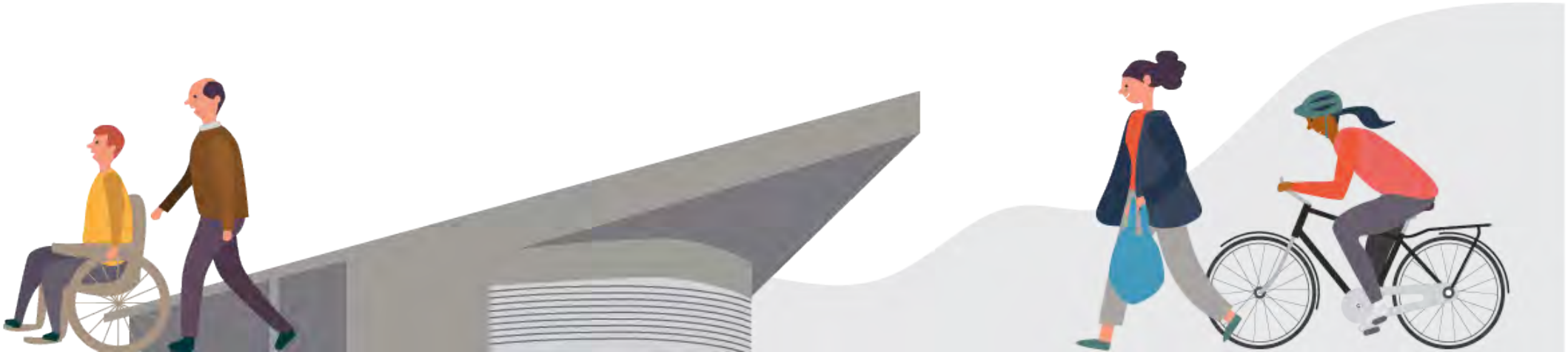
Skills and resource: Glasgow City Council, like many organisations and companies, have been struggling to recruit skilled staff for a range of roles. All stages of project delivery require specialised expertise, it can take years for an industrial skills base to transfer to needs of active travel delivery.

Next Steps

The next year is crucial to set the groundwork for rolling out the City Network initially and then over the next decade. By September 2022 Glasgow City Council will deliver a final report detailing the City Network areas and projects which will be prioritised and a robust workplan for how those projects can be delivered in short timescales. This will include new City Network projects and those active travel projects that are at various stages of the planning and delivery pipeline.

Glasgow City Council will continue to engage with Transport Scotland to work out sustainable long-term funding for the City Network where it meet the aspirations of Active Freeways and other proposed interventions under the STPR2 framework. Glasgow City Council will also be exploring the range of funding mechanisms that may suit wider aspects of the City Network and Liveable Neighbourhoods Plan.

The final report will recommend appropriate governance structures for the project which consider the needs at city, regional, and national level as well as being publicly accountable.



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