

# WALTHAM FOREST MINI-HOLLAND DESIGN GUIDE



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# Foreword

It is an exciting time for Waltham Forest. The Mini-Holland Programme provides an opportunity to make real change to the physical look and feel of Waltham Forest's streets and roads in a way that prioritises the likes of residents on bikes, children on scooters and of course pedestrians. Safer and more expansive infrastructure for people on bikes, children's scooters and pedestrians encourages people to move around the borough in ways which are better for themselves and for all the residents and businesses located in Waltham Forest.

Safer streets, less congestion, better air quality, improved public health and wellbeing, improved local environments and increased economic activity in our town centres and shopping parades are just some of the wider benefits of our Mini-Holland Programme.

This document has been produced to guide designers and other interested parties in the development and introduction of the Mini-Holland Programme. The guide includes our street typologies developed specifically for the programme, as well as examples of great cycling and walking infrastructure from elsewhere in the UK, Europe and further afield. It also includes examples of changes that can be made to our residential streets to make them better places for all, and particularly those people wanting to walk and cycle.

This is the first draft of our design guide. We know that there is still much to learn both in how we design our streets, implement and modify those designs and how our residents and businesses use them now and in the future. We intend to review this document periodically and amend it both from our learning and that of colleagues working on improving infrastructure and public realm improvement programmes and schemes for pedestrians and people on bikes both in London, the UK and in Europe.



**Cllr Clyde Loakes,**  
Deputy Leader and  
Cabinet Member for Environment

# Introduction

Waltham Forest Council's Mini-Holland Programme provides an opportunity to improve the street environment for all road users. Some of the key corridors in the borough will be subject to a step change in the allocation of road space, making better use of available space, and making major improvements to the High Streets and corridors in the borough, particularly for people who walk and cycle.

This document has been produced to give guidance to designers working on the delivery of the programme and should also be referenced by anyone working on the public highway in Waltham Forest. It should however be considered a design guide and not a design standard. The recently published London Design Standards should be used as the primary reference for standard details and applications of approved cycle infrastructure.

## Overarching vision

The overarching programme vision is to:

- Create distinctive cycle friendly urban quarters wedged between forest and marshland, comprehensively integrated into the sub-regional transport network
- Deliver exemplary streetscape typologies which facilitate change in the way people travel, to make cycling and walking the default option for local trips
- Implement innovative schemes, drawing on international best practice, which will benchmark cycling provision in the UK
- Implement proposals as part of a "place-making" approach to the design and management of public space for the benefit of all users, particularly people walking and cycling.

## Projects

The key projects are:

- Walthamstow Town Centre and Villages
- Lea Bridge Road - a street for everyone
- A network of cycling and walking routes (Forest Road, Leyton to Blackhorse Road, Leyton to North Chingford)
- Town centres (North Chingford, Highams Park, Leyton, Leytonstone)
- Complementary measures (cycle training)
- Cycle sheds at stations.

# Key Principles

The key principles of this design guide have been sourced from a wide variety of examples of best practice from across the globe but primarily from mainland Europe and elsewhere in the UK. The guide makes particular reference to:

- Transport for London (TfL) Cycle Design Standards
- The Mayor's Roads Task Force.

The Mini-Holland Programme is focused on making changes to the road network of the borough to improve conditions for people who cycle, including opportunities to improve conditions for all road users, particularly pedestrians. The requirements of pedestrians and public transport users should be given a high level of consideration when redesigning the public realm, and minimum standards conformed to ensure a fair distribution of space is undertaken. This project also acts as an opportunity to create a new all-inclusive street scene which benefits all users including (but not limited to):

- Local residents
- Local businesses
- People who cycle
- Pedestrians
- Public transport users
- Other road users
- Children
- The elderly

## Where are we starting from?

Most of the main corridors that the Mini-Holland Programme will impact upon have some provision for people who cycle, normally in the shape of an advisory cycle lane or sharing space allocated to buses. This provision is however dated and in some instances not fit for purpose particularly when you want people of all abilities to be able to cycle.



The design typologies included within this document should be applied where possible to the network of Mini-Holland routes. They provide the desired levels of service so that all people who want to cycle in the borough can, and so this design guide should be used as the primary reference document.

A Level of Service for Cycling assessment has been produced by TfL as part of the 2014 London Cycle Design Standards (LCDS), which includes guidance on the types of provision that are suitable given the volume of cyclists and vehicles, and traffic speed. This tool should be used in conjunction with the street typology and hierarchy included in this guide when deciding which interventions and design typologies should be applied to corridors included within the Mini-Holland Programme. The LCDS should also be used in situations where due to limiting factors one of the design typologies cannot be applied.



The original proposals included within the successful bid will score highly if implemented as proposed but an assessment by designers should always be carried out as part of the design process.

### Where are we going?

The Mini-Holland Programme has been designed to evoke a step change in travel behaviour with an aspiration for a modal shift from car to bike, particularly for short journeys (less than three miles). Cycle numbers on the borough's roads vary, but most of the main corridors that are included within the Mini-Holland Programme are seeing significant increases. It is estimated that cycle trips account for up to two per cent in the borough and a target included in the Council's 2012 Cycling Action Plan (pre Mini-Holland) was set to increase this to three per cent by 2016/17. A modified target due to the successful Mini-Holland bid has been set of ten per cent by 2020.

## A cycling strategy for Waltham Forest

By the end of the Mini-Holland Programme the borough will have a network of high quality cycling and walking routes designed to the specification outlined in this design guide. This does however only include the roads and areas included within the bid programme.

A cycling strategy for Waltham Forest is currently being developed by the Transport Planning team. This strategy will provide the framework for the development of a cycle network for the borough, building on the infrastructure provided as part of the Mini-Holland Programme.

### Designing for the future

Cycle counts are carried out at many of the major junctions in the borough. Whilst we want to make all movements at junctions, main corridors and in residential areas safe for cycling, the volume, flow and movement (both existing and projected) needs to be considered during the design process.

Cycle counts are a good source of baseline data for minimum volumes of cyclists to cater for whilst designing infrastructure for the Mini-Holland Programme, however are only the existing situation. Cycle counts undertaken in recent years in the borough have shown massive increases year on year. For example, Lea Bridge Road has seen the number of people cycling increase by 507 per cent from 2000 to 2014.

Whilst count data shows growth in people cycling in the borough year on year indicating, to a certain extent, trends and patterns, it should not be relied upon to guide the design of an aspirational programme such as Mini-Holland.

A more relevant approach would be to apply the ten per cent cycling mode share (aspiration for 2020) to traffic data collated for each route and use this as the expected level of cycling. For example, Ruckholt Road has daily traffic volumes of 24,500 vehicles. Assuming 20,000 of those are private vehicles, cycling infrastructure should be designed that will have capacity for in the region of 2000 cyclists a day.

The tables below set out the number of people cycling defined as low, medium and high in the new LCDS and levels of service that should be provided for these volumes.

	Peak Hour	6am to 8pm	24-hour
<b>Low</b>	< 200	< 1,000	< 1,600
<b>Medium</b>	200-800	1,000-4,000	1,600-5,500
<b>High</b>	800+	4,000+	5,500+

Facility	Preferred width	Absolute minimum
Cycle Lanes (including contraflow lanes)	2.0m	1.5m
Lead in lanes to ASLs	2.0m	1.2m
Bus/Cycle Lanes	4.5m	4.0m
<b>1-way cycle track</b> (including segregated lanes)		1.5m (low flow) 2.2m (medium flow) 2.5m+ (high flow)
<b>2-way cycle track</b>		2.0m (low flow) 3.0m (medium flow) 4.0m+ (high flow)

The design typologies for the Mini-Holland corridors have been developed with medium flows (the current volumes on most of our main corridors) with an expected growth towards high flows.

## Cycle safety

The safety of people cycling both in terms of actual (no of collisions) and subjective (how safe a journey feels) have an impact on cycling. We want to make sure through the Mini-Holland Programme that the road network in the borough feels and is safer for people cycling.

Many of the existing issues such as collision hot spots will be addressed by the Mini-Holland Programme as they are located on our network of routes. There are however other causation factors that can be designed out with an understanding of the issues and careful consideration of them during the design process.

The majority of collisions involving people cycling happen at junctions. All major junctions on routes included in the Mini-Holland Programme will be subject to major redesigns to accommodate much improved facilities for cyclists.

Another major cause is 'door swipe', when cyclists are struck by car doors while passing parked vehicles. Consideration of the risk of 'door swipe' should always be considered when parking or loading is proposed next to cycle infrastructure.

The five conflict types most commonly resulting in cyclists killed or seriously injured (KSIs) to between 2011 and 2013, as shown in Transport for London's Cycle Safety Action Plan, are shown in the table below.

	<b>Manoeuvre description</b>	<b>Seriously injured casualties (% of total)</b>	<b>Fatal casualties (% of total)</b>
<b>1</b>	Other vehicle turns right across path of cyclist	243 (14%)	2 (5%)
<b>2</b>	Cyclist hits open door / swerves to avoid open door of other vehicle.	160 (10%)	2 (5%)
<b>3</b>	Cyclist and other vehicle travelling alongside each other.	146 (9%)	4 (9%)
<b>4</b>	Other vehicle turns left across the path of cyclist	125 (9%)	11 (25%)
<b>5</b>	Other vehicle fails to give way or disobeys junction control and collides with cyclist	96 (6%)	1 (2%)

More information on cycle safety can be found at:

[www.tfl.gov.uk/cdn/static/cms/documents/cycle-safety-action-plan.pdf](http://www.tfl.gov.uk/cdn/static/cms/documents/cycle-safety-action-plan.pdf)

## Continuity

It should be remembered that cycles are powered by the people on them and that stopping and starting is not only frustrating but also uses lots of energy. This is understood in many of the towns and cities that we want to emulate, and is one of the key principles of this document.

A cycle route is only as good as its weakest link. If, for example, connectivity is not provided across a main road that is quick, safe and easy to use (perception and reality) it is likely that the route will not be used to its fullest potential and it will remain a barrier to less confident or potential cyclists. There is also a risk that cyclists will adapt and adopt behaviour that is non-compliant, such as jumping signals to overcome delays that are designed in to new infrastructure.

## Future proofing

Any changes to the remaining network proposed as part of other traffic schemes or in light of developments or regeneration work should use this document as a guide to how road space should be allocated and provision such as cycle parking should be provided.

## Rat running and local traffic management

Rat running is the term given to non-local traffic which permeates through residential areas in order to save time by cutting out congested main roads or junctions. It can turn quiet residential roads into fast, noisy, dangerous locations with poor air quality. As this is where people live, it can affect quality of life, and make it less likely that children will 'play out' and that people will socialise in their own streets.

Removing rat running traffic from local residential roads is one of the key objectives of the Mini-Holland Programme. It creates conditions that are conducive to people walking and cycling and even improve conditions for local car drivers. The main ways to alleviate rat running traffic is through closing roads to through traffic and in some instances introducing

networks of one-way streets. It should however be noted that one-way streets are often faster than two-way streets and unless contraflow cycling is allowed this makes cycling a less attractive option.

## Modal filtering

Modal filtering is the term used to describe the closing of roads/areas to through traffic whilst permitting access for people walking and cycling (and sometimes public transport). It is achieved through the use of modal filters, a type of road closure that still permits people to cycle through gaps in any features introduced, whilst preventing motor vehicles travelling through.

They are placed at strategic locations normally at point of entry or halfway down residential streets. These are often introduced in a network that over time prevents rat running traffic from travelling through a residential area. In addition to reducing traffic volumes, they also provide an advantage to cycling as a mode of transport in the area.

Modal filters will be an important feature for the villages and town centres scheme. The plans for these areas rely on the use of such measures to create the right conditions for walking and cycling. There are a variety of modal filters types available which also vary in cost. A variety of examples are included in the traffic management section of this document. Consideration should be given to access in residential areas, particularly for public transport and servicing but residential areas should not be left permeable to all traffic.

## Designing for pedestrians

Waltham Forest Council's Mini-Holland Programme is not just for people who cycle. The programme provides an opportunity to improve conditions for all road users and particularly pedestrians. The proposals include improved footways, new public spaces, new crossing points and the introduction of innovative junction designs that will give more priority to vulnerable road users.

There are, however, measures which may cause issues for pedestrians particularly while they become used to new road layouts. LCDS suggests that 'priority should be given first to direct pedestrian access to and from destinations, and then to cycle access'. This will be particularly important in busy areas where there is a higher level of footfall and greater risk of conflict. The careful separation of different road users, including people who walk and cycle, should always be a central part of the design process as should ensuring a high level of service to those walking as well as cycling.

### Legalising illegal behaviour

A common complaint about people who cycle is that they break the rules, either jumping traffic lights or riding on the pavement. Whilst this may be the case in some instances it is unlikely that most people who cycle want to behave in this way. It is often due to reasons associated with fear of traffic conditions, self-preservation, time saving or that there simply should be some form of cycling provision in these locations which is lacking.

In Denmark there is a real focus on observing the behaviour of cyclists. Where 'illegal' behaviour is the norm, instead of enforcing against this behaviour, consideration is given to why cyclists are breaking the rules. Where possible cycling is then permitted with the right conditions to avoid conflict with other road users particularly pedestrians.

A local example would be the access between Audrey Road and Howard Road in Walthamstow. Historic issues with people cycling through the 'cut through' have been addressed by adding standard 'no cycling' signs up. Cyclists use the cut through because it is a safe, direct route parallel to Hoe Street, providing a quiet route from Forest Road into the area north of Walthamstow Village.

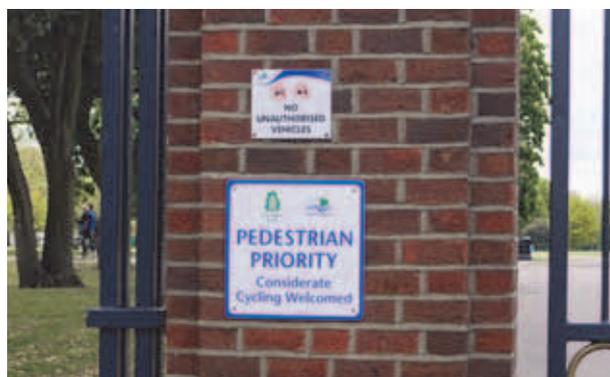


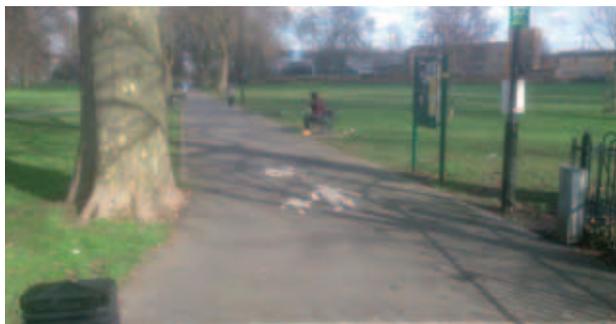
As seen in the picture, bollards and signage have been introduced to deter cyclists. Planters (although well intended) have been added to the bollards and signage to deter people cycling through. This suggests that there is a desire to use the route whatever obstacles and signage is in place. The path is adequately wide to allow considerate cycling and could arguably accommodate a segregated cycle track in the middle in addition to providing for pedestrians.

### Cycling in the borough's parks

Cycling in parks is a contentious issue and one that must be treated with due care and attention. The borough's parks provide free open spaces for residents and visitors to the borough to enjoy and many have been the subject of recent refurbishments.

Many of these parks are also in strategic locations meaning that they could in many instances provide peaceful off-road alternatives for people cycling and of course great places for people to learn to ride.





Shared pedestrian/cycle path in Millfields Park, Hackney



Delineated shared path, Queen Elizabeth Olympic Park

Neighbouring Hackney and Tower Hamlets have made great use of their parks as part of their cycle networks. With the selection of strategic routes through parks, the allowance of considerate cycling on shared paths, and the segregation of people walking and cycling a number of alternatives to busy roads have been provided.

Design teams should consider how routes through parks for people cycling could be included in the village and town centre final proposals, primarily as quiet secondary routes and how best to design these into the wider network.

The routes should also be reviewed from a condition and lighting perspective. The ride experience and personal safety of people cycling should be major considerations in the design development process.

A pilot project looking at permitting cycling in the borough's parks is going to be run in parallel with the Mini-Holland Programme. The parks are subject to

'dawn til dusk' opening hours so this should always be taken into account when using parks as part of routes. After dark alternatives should therefore always be included in design proposals.

It may be that slight modifications to parks enable access to routes through them all the time or improvement works to pathways will be necessary. The design team should work with the parks team to develop proposals including widening of paths and changes to access etc.

## Education and enforcement

Any infrastructure to be used by people is only as good as the enforcement deployed to prevent illegal behaviour. The programme will bring cutting edge street design, changes to loading and parking restrictions and changes in the way many people travel in the borough. It may be necessary to consider an education campaign for road users so they can understand the new infrastructure. This will ensure road users are safe and people using the public highway understand how they should behave.

The enforcement of restrictions to prevent congestion, illegal parking activity blocking pedestrian routes or cycle tracks will be necessary to ensure road users are given the space and priority they need and deserve. During the design process, consideration should be given to the ability to enforce proposals and ensure that adequate provision is provided for vehicles that need to make deliveries or service properties.

## Opportunities during planned maintenance

Planned maintenance such as resurfacing gives an opportunity to review line marking in place on the borough's roads, making changes to them relatively quickly and cost effectively. This does not necessarily mean the reallocation of road space but consideration to de-clutter and assess the necessity of existing line marking. Further details can be found in the carriageway standards section of this document.

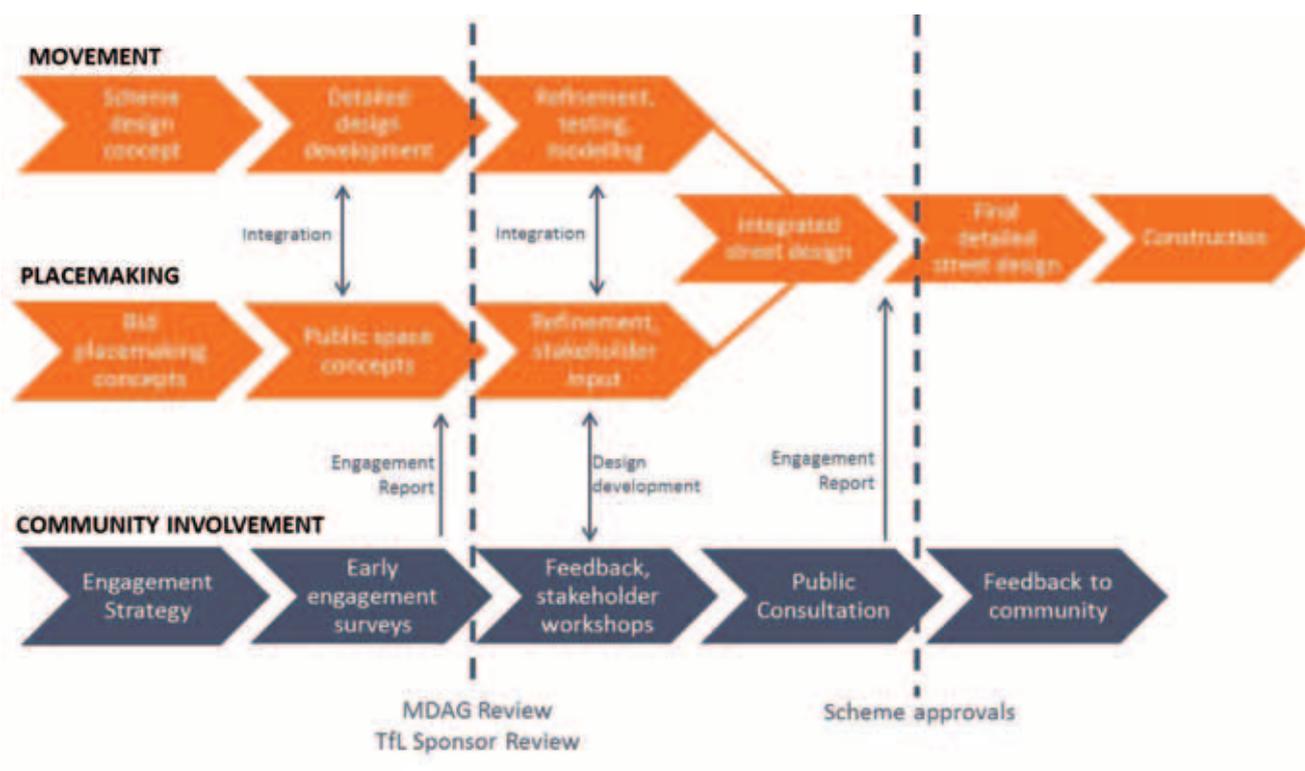
# Design process

The design team for the Mini-Holland Programme is multi-disciplined and multi-skilled. It includes the Council, cycling specialists, consultants, architects, residents, Transport for London and numerous other stakeholders.

There is a series of design stages that each project will go through including a number of gateway reviews and public engagement and consultation.

## Co-design

Waltham Forest Council's Mini-Holland design process has been developed to enable the local community to get involved through identifying existing issues, and to feed into the final proposals for each Mini-Holland scheme prior and post design reviews with the Mayor's Design Advisory Group and Transport for London. This is done through on-line engagement platforms, workshops, surveys and consultation documents.



For designers there is a key role to play in ensuring suggestions by local residents or businesses are included wherever practicable in final design proposals. Residents and businesses who have contributed to the development of designs should be kept involved in the design development process wherever relevant and feel ownership of the final scheme delivered.

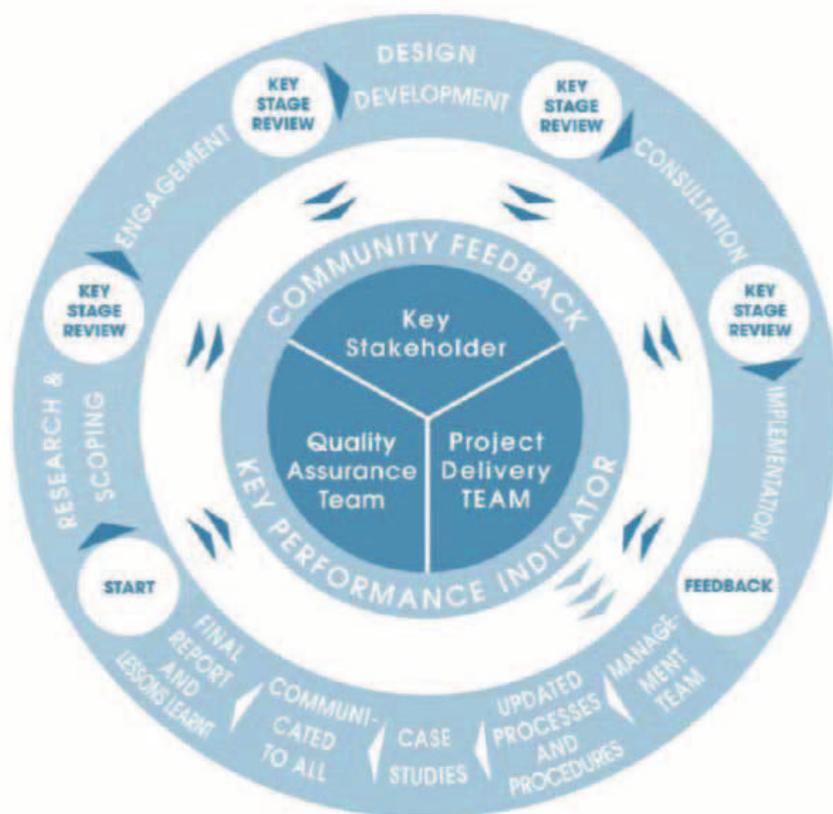
There are, of course, risks associated with community involvement in a scheme such as Mini-Holland. Most people care about the area they live in and often feel they cannot influence change or improvements. Once empowered in the project development process the problem can become managing expectations around levels of involvement and available timescales.

This is especially the case in a condensed programme such as Mini-Holland. Designers should therefore ensure those involved in the design development process are fully aware of the timescales associated and potential levels of involvement.

### Continuous improvement

The design process has also been developed with continuous improvement in mind. The Mini-Holland Programme is ground breaking, applying street design and technology that has not been applied anywhere in the UK before. Whilst there are always similar examples to learn from in the UK or variations in Europe, it is unlikely that we will get everything right every time.

For that reason, review of projects, their processes and more importantly what is implemented will be assessed by us and the residents, businesses and visitors to the borough. We will apply any learning and improve what we do and how we do it to ensure we do provide the best possible infrastructure from the Mini-Holland Programme.



# Understanding people on cycles

## Cyclists dynamic envelope



Most cyclists on the road in the UK ride a traditional cycle which has a dynamic envelope of 1m. This is, in effect, a 0.75m wide bike with wobble room which a cyclist uses whilst accelerating or decelerating, or when subject to cross winds. It is vital that minimum cycle track widths reflect this and particularly important that adequate width is provided at the approach and exit from junctions and other locations where cyclists may have to stop.

The minimum widths developed for the cycle track typologies have been based upon allowing two cyclists to ride side by side, and enable cyclists to comfortably overtake each other.

Safe cycle movement requires a cycle lane or track to be of a width that will allow for deviation in horizontal movement. This is known as the cyclist's dynamic envelope and is affected by speed, gradient, wind speed and experience.

Other influencing factors include increased deviation when pulling away from a stationary position and also more competent riders will lean into corners potentially increasing the dynamic envelope by an extra 0.5m. For this design guide, a dynamic envelope of 1m has been applied.

## Specialist bikes

The term specialist bike applies to a wide range of non-standard cycles from hand cycles to cargo bikes. Over time, as the Mini-Holland Programme is implemented, specialist bikes are likely to become more popular in the borough. Parents use cargo bikes to take their children

to school and in places with mainstream cycling they are used by all kinds of people for all kinds of uses. In Copenhagen one in four families uses a cargo bike instead of a car. It is hoped that the introduction of quality cycling infrastructure will help those who want to cycle to have the opportunity to do so.

New infrastructure should not introduce new barriers to cycling. When designing cycle infrastructure consideration should be given to the users of specialist cycles. Key things to avoid are:

- Sharp turns either from or onto cycle tracks or lanes into modal filters
- Narrow (less than 2m) dropped kerbs at cycle access from carriageway
- Narrow (less than 1.5m) cycle routes through modal filters
- Narrow gates or chicanes
- Straight edges and corners
- Bollards closer than 1.5m together
- Speed cushions.

The use of specialist bikes including cargo bikes, trailers and bikes specifically designed for those with mobility issues are becoming more popular and Waltham Forest Council's Mini-Holland Programme should support this.

The specific requirements of these cycles (width/turning movements) must also be taken into account. Scale drawings of typical dimensions and special requirements are included in the final draft of the London Cycle Design Standards.



# Carriageway standards

Many of the main roads in the borough which are included within the Mini-Holland Programme have remained unchanged over recent years. Lane widths, junction geometry and the overall size of features, such as central reservations, mean that there is significant scope for road space reallocation. This is particularly the case on main roads where despite public opinion about congestion, worsening traffic volumes have reduced.

Excess road space for vehicular traffic suggests that the environment is for motor vehicles. This reinforces a sense that the main roads in the borough are links rather than places, encouraging higher vehicle speeds and making street environments less appealing to people walking and cycling. The Mini-Holland Programme provides an opportunity to reallocate road space to uses other than vehicle lanes. This process can be to provide space to a number of other uses including:

- Cycle provision
- More pedestrian or public space
- Planting
- Improved public transport facilities
- Parking and loading (including cycle parking).

Carriageway widths of 3m provide enough width for all traffic to use lanes effectively, particularly on roads with multiple lanes in the same direction. However discussions with London Buses have indicated an aspired lane width of 3.2m for bus routes. Lane widths may need to be increased near bends or deviations in vehicular paths but this should be the exception and not the norm.

Where large vehicles will be travelling in opposing directions designers may consider 3.2m lanes to be necessary to avoid conflicts. The likely impact on vehicle speeds should however be considered as part of the design development and decision making process.

## Cycle track standards

Cycle tracks or lanes should be 2.5m wherever possible but a minimum 2m throughout unless there are significant limiting factors. The width of someone on a bike can be simplified as a 1m width. An additional distance of 500mm is needed for a cyclist to comfortably overtake another cyclist. To ensure schemes are future proofed for extensive growth in cycle usage overtaking space is vital.

In some locations it is simply not feasible to introduce tracks or lanes as wide as above. An absolute minimum width of 1.5m (3.0m for two-way tracks) should be applied throughout the programme.

As mentioned in previous sections, a cyclist's dynamic envelope is affected by a number of variables but particularly accelerating and decelerating, crosswinds and gradient. Consideration should be given to providing wider tracks uphill than downhill where additional road space is available.

All cycle tracks should be at a different level to adjoining footways to reduce the risk of conflict between road users. This should also increase compliance and encourage cyclists to use the segregated space provided and deter pedestrians from walking in cycle tracks. Splay kerbs of 45 per cent or lower should be introduced as standard on the edges of cycle tracks next to the footway.

The use of colour should be considered in locations where it is felt contrast from pedestrian areas or road space for general traffic is necessary. Alternatively the footway can be modified through material palette or colour to provide the contrast required.



## Footway standards

In order to gain the additional space required to provide Mini-Holland compliant cycle tracks, it may be necessary to reallocate some footway space. This will of course be offset considerably with the vast improvements for pedestrians that the programme will bring. It must be remembered pedestrian space is still in much greater demand than cycle space and must meet minimum standards. Inclusive mobility states that a clear width of 2000mm allows two wheelchairs to pass one another comfortably.

This should be the minimum clear footway provided throughout the Mini-Holland Programme. The only exception to this would be in specific locations where doing so would compromise the ability to provide continuous provision for people cycling.

All street furniture should ideally be aligned with a 450mm clearance to the kerb. However, LCDS suggests that this can be reduced to 250mm where street furniture is located next to carriageway allocated to cycling.

One way to increase available footway width is to de-clutter the corridor. This should be central to the design approach to all Mini-Holland schemes but is particularly relevant for sections with high pedestrian footfall.

De-clutter can be achieved by relocating signage to lamp columns, doubling up signage on posts and where relevant applying principles such as restricted zones. A review of public phone boxes, retail

advertising boards and agreements for the placing of stock outside premises should also be undertaken as part of this process.

## Approach to signing and lining

The introduction of signage and line markings condition the appearance of road space to suggest a sense of ownership to motor traffic and not very welcoming for those walking and cycling. Whilst there is a requirement to ensure that the layout of roads is simple, safe and easy to navigate for all road users this should not be at the cost of other road users.

A minimalistic approach to signing and lining should be deployed throughout the project. De-cluttering of existing street furniture will be conducted throughout the programme so new designs for the borough's roads and neighbourhoods should not undermine this. It is recommended that 50mm wide line marking should be utilised throughout the programme. Parking bays can be delineated with contrasting materials in place of line markings which reduce the visual impact of kerb side restrictions.

## Centre line marking

The use of centre line markings should be carefully considered as to whether they are a necessary part of carriageway design. There are theories within the transport industry that centre lines contribute to feelings of ownership of road space in vehicle drivers and the removal of them has been shown to reduce vehicle speeds.

There is no requirement for centre line markings. Both The Mayor of London's Better Streets Policy and Manual for Streets 2 suggest that they are not a requirement and encourage designers to question their use among other items of street furniture.

Manual for Streets 2 specifically references centre lines as follows: "MfS1 notes that the use of centre lines is not an absolute requirement and included reference to the reductions in speed that result by omitting centre line markings on carriageways. This has been done successfully on busy routes as well as in village settings. Removing centre lines can

be done easily when carriageways are resurfaced, with an immediate saving in capital and ongoing maintenance costs”

The Highway Act 1835 makes it a legal requirement for drivers to keep to the left, and this is reinforced in the Highway Code. The provision or non-provision of a centre line in no way affects this.

A TfL centre line removal trial in Seven Sisters Road, Haringey, and Wickham Road, Croydon, found a reduction in driver speed when centre lines were not replaced after resurfacing. It is however important to note that not all sections of all roads in the borough would be suitable for removing central markings, particularly where the markings highlight a particular hazard.

### Speed limit

A 20 mph speed limit is proposed for all main cycle route corridors especially in shopping areas and near schools. The application of the speed limit should however be considered as part of the assessment and modeling of the corridor. It may be that due to the fact that people who are walking and cycling are away from general traffic that a 30mph limit for general traffic can stay in place.

The street design typologies developed for the Mini-Holland Programme aim to reinforce the slow speed message through aesthetic and physical measures, changing the character of the borough's high streets to less traffic dominated environments, places rather than links.

This means redesigning spaces so that traffic automatically slows down, for example removing centre line, greening etc. Where physical measures are required, they should be as cycle and pedestrian-friendly as possible. For instance, raised tables at junctions that facilitate diagonal pedestrian crossing (even if informally), and sinusoidal full-width speed humps rather than cushions that can create conflict points where the desire line for motor vehicle and bicycle wheels pass through the same gap.

## Maintenance for new infrastructure

A maintenance strategy for the routes and areas included with the villages and town centres should be put in place that dictates a 'reinstate as new' policy. Footway and carriageway material should be reinstated with limited visual impact and no vertical deviation from the original design (unless an alteration is required to overcome a specific issue such as drainage problems). If flags and setts are used within footways and cycles tracks or lanes they must be re-laid with no extruding edges which would act as trip hazards to both people walking and cycling.

Where non unit surfaces are to be re-laid such as asphalt or bound gravel it is imperative a patchwork appearance is avoided by using exactly the same spec material and reinstatement occurring over the entire width of the path in question.

Tree leaves when wet can be a significant hazard to cyclists. Where possible, trees should not be located close to bends in the cycle route or in locations where cyclists are likely to regularly brake (floating bus stops, side roads, etc.). Regular cleansing of the cycle track should be undertaken during the winter to ensure leaves are removed.

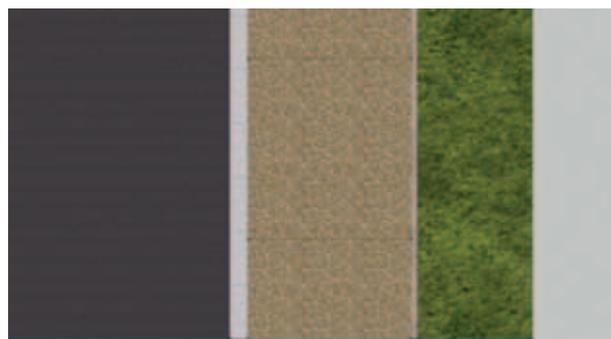
Regular checks of the entire network should be undertaken to ensure there is no ponding, uneven surfaces, rutting or issues relating to ironworks.

## Drainage

Side entry drainage kerbs are the preferred choice for cyclists as it removes the need for gullies within the cycle track. However, the Council's preference may dictate a gully based system. If this is the case it would be beneficial for the cross fall of the cycle track to direct water onto the main carriageway where standard gullies are used alongside the kerb edge. If gullies are to be used within the cycle track or lane then it is imperative that the slots run perpendicular to the kerb edge or wheel direction. Where possible, recessed covers within the cycle track or lane which utilise the same material as within the cycle track should be used, which not only improve the aesthetics but also reduce the chance of bicycle tyres slipping on wet ironmongery.



Poor reinstatement following excavation of path



Good reinstatement over full section of path

# Cycle routes

This section of the design guide provides details of the cycle routes to be introduced as part of Waltham Forest Council's Mini-Holland Programme. It introduces the street typologies developed specifically for the network of cycle routes to be introduced as part of the project and also discusses more traditional forms of cycle infrastructure.

The new route typologies should be used as the basis for any design work. Input into the development of public spaces, green space and bespoke local detailing will be provided by architectural partners and other design specialists. Designers should however consider which design typology is most appropriate given the surrounding existing and aspired land use. For example designs for Forest Road should take into account the opening of Walthamstow Wetlands and the development of the Blackhorse Lane area.

It should also be noted that the three typologies have primarily been developed for the flagship routes of Lea Bridge Road and to a lesser extent Forest Road. Given the budgets available for some of the other routes proposed it will not always be possible to introduce the typologies in their entirety and other lower cost solutions may be required. For this reason a discussion of some of the available forms of light or semi segregation is also included.

## Street typologies

Creating safe, inclusive and interactive streets is about more than just selecting materials and allocating space to different forms of movement. Successful streets are places rather than thoroughfares; they encourage social interaction and create an equal sense of importance amongst all users. The purpose of this project is to create streets which are no longer arteries for vehicular traffic, but instead create a visual step change in the environment to facilitate an improved walking and

cycling environment and safer movement for all users as part of a "place-making" approach to design and management.

The allocation of space and the trade-off between users is a complex design objective in which pleasing all users is rarely possible. Instead an amicable outcome must be reached which relates to the street uses and demands. Some objectives such as cycle safety should not be compromised. The Roads Task Force have created a visual table to explain the different types of streets commonly found within London. Whilst this is not an exhaustive list, it highlights just some of the different street typologies.

The creation of street typologies is designed to show how the design principles will be applied to specific sections of the network.



## Waltham Forest Mini-Holland Street Typologies

For the Mini-Holland Programme three distinct typologies have been created. Users will be able to familiarise themselves with design principles and conform to small, legible set of standards. This will alleviate confusion amongst all road users. The typologies will also relate to their surroundings to ensure the more rural, green areas of the borough do not become standardised urban cycle routes.

There are currently three street typologies:

- Green Link
- Urban Connector
- High Street.

The following sections of this document provide details of the three typologies developed and specific detail related to junctions, greening and parking or loading.

# Green link

Our 'green link' typology has been developed to be used on sections of corridor bordered by green space such as the Lee Valley, Walthamstow Marshes or Epping Forest. The design has been developed to be sympathetic to the local environment whilst still providing world class segregated cycle facilities.

In sections that have rural typology a soft materials palette has been developed using neutral colours, sustainable drainage and subtle lighting. The following section provides details of the specific elements of the design typology.

## Spatial dimensions

The rural locations offer the best opportunity to maximise cycle track widths for long sections and a consistent 2.5m should be provided throughout these areas to allow cyclists to pass one another. Ideally the same 2.5m width should be utilised for the footway and a width of 2m used for any grassed area in between footway and cycle track.

## Cross section drawing

The visualisation below shows the cross section of the rural typology with aspired widths for each road user. It should be noted that these are aspirational and may not always be achievable due to limiting factors.



The footway has been aligned next to the road to provide connectivity for pedestrians to crossing points and bus stops. The offset of the cycle track also means better alignment of the track with new bridges. It should however be noted that in some locations it may be preferable to reverse this order. Continuity should be the primary consideration and the switching of tracks and footways should be kept to a minimum.

Wherever feasible the footway should be offset from the carriageway to provide an added level of comfort for people walking. Consideration to the connectivity with destinations, crossing points and public transport infrastructure should be a primary factor when deciding on the alignment.

## Materials

The materials palette for the rural street typology should provide a softer, less urban feel. To minimise visual intrusion in green parts of the cycle track and footway materials should be constructed using subtle coloured materials. In keeping with the natural feel it is felt that rather than using an edging detail, a steel edging strip should be used to allow the grass surfaces to run to the edge of the cycle track and footway.



However, in sections where the footway and cycle track are adjacent to each other segregation should be provided through a height differential using splay kerbs. Busy pedestrian areas should be highlighted by contrasting materials or patterns.

The use of a porous resin bound material should be considered. When selecting materials for use on cycle tracks and routes, consideration should be given to the impact on cyclist speed. Some materials, particularly those that are spongy or made with larger aggregate can be energy zapping to cycle on. The requirement for such materials needs to therefore be considered against the impact that they may have on the comfort of cyclists.

## Drainage

Effective drainage is a vital part of good cycle infrastructure. Ponding and the sinking of inspection covers and drains cause serious safety concerns for cyclists. Flooding is also a serious issue for both the borough and the country, with changes in climate likely to make periods of heavy rainfall more frequent and intense. The design of cycle provision and changes to carriageway layouts should include sustainable drainage solutions wherever feasible.

In sections of rural typology, permeable materials will be used for the construction of new cycle tracks. Opportunities to introduce swales and other natural drainage solutions should also be considered,

particularly where this can increase biodiversity by providing new habitats for wildlife. The design of the rural typology streets means SUDs can be incorporated into the 2m grass verge in between the cycle track and footway.



## Parking and loading

On carriageway, parking and loading in sections of rural typology should not be encouraged unless there is a specific need. Whilst this will not impact the continuity of the cycle routes, it will adversely impact the movement of general traffic.

Most destinations or attractions (Lee Valley Ice Centre or Walthamstow Wetlands) located on sections of routes with rural typology have their own off street parking and loading provision. Loading and parking should never be afforded for if it will mean routes for cyclists being terminated and cyclists having to enter the main carriageway.

## Entrances and exits to off street parking, loading and servicing

At entrances to off street parking and loading, people walking and cycling should get priority over vehicular traffic entering or exiting. Accesses or egresses with low vehicle numbers should be converted to 'blended or Copenhagen crossings' wherever feasible. Where this is not feasible, consideration should be given to redesigning the junction to give cyclists and pedestrians greater priority over vehicular traffic.

## Lighting

To encourage use throughout the winter months, high quality lighting provision is necessary. The spatial layout of the rural typology means careful consideration to the position of all lighting columns will be necessary. Tree planting will feature within the swale locations and so lighting must be situated to avoid dark spots created by tree canopies.

Because of the provision of a grass verge area the distance between front of footway and rear of cycle track will be in the region of 7m. As such, placement of the lighting columns should be to the rear of the footway (reducing the 7m to 4.5m) and the use of dual arm columns with a lower outreach arm directed towards the cycle track should be considered.

In specialised areas of track expansion where the route deviates from the main carriageway, low level lighting should be utilised which is sympathetic in size and material to the green surroundings.

## Planting and landscaping

In keeping with general character traits of the rural typology, planting will be heavily utilised within these areas. The green buffer zone should, for the most part, accommodate low level planting to allow inter-visibility between cycle track and footway or carriageway and aid natural surveillance.

Designers should work with architects, local residents, businesses and key stakeholders such as the Lee Valley and the Corporation of London to agree suitable planting proposals. Working with key local stakeholders such as these will also

facilitate relationships to be developed for the future maintenance of green space etc.

## Trees

There is an aspiration that through the Mini-Holland Programme we increase the number of trees in the borough and the diversity of indigenous species. Trees play a vital role in the public realm both from an environmental perspective by screening pedestrians, cyclists, residential and shopping areas from harmful emissions, and by making the public realm feel greener and more pleasant.

Exceptionally, in some locations the removal of individual trees may be necessary to provide the space required for providing adequate provision for pedestrians, cyclists or vehicular traffic. In instances such as this at least two new trees should be introduced in the immediate area to compensate. Species selection should always be in line with the Waltham Forest Tree Strategy 2010-20.

## Street furniture

Street furniture should be predominantly timber in construction to be in keeping with the green link typology. Seating and bin locations can be set back into the green buffer zone. Consideration should also be given to the convenience for cyclists by introducing angled rubbish bins, places to rest and facilities such as tool stations and on street pumps. As there is more available space in areas where green link is to be applied there may be locations where artwork that doubles as amenity by incorporating seating or play can be introduced.



Angled bin for cyclists in Copenhagen

# Urban Connector

The Urban Connector typology can be used to link between the green link and High Street character areas. It is also applicable to areas where land use is mixed or there is a need for at carriageway grade access from a side road or entrance.

It consists of an at-carriageway grade cycle track segregated from vehicular traffic by a kerb island. Additional features such as parking and planting can be added and it will be combined seamlessly with sections of High Street typology.

The typology may also be the only solution possible in sections of narrow road width combined with other limiting factors. Splay kerbs of 45 degrees or less should be used on the inside kerb-line (between footway and track) and on the outside if pedal strike is a concern due to the height of the kerb island.



## Spatial dimensions

As per the guidance within the Overall Design Principles section, general traffic lane widths are to be reduced to a maximum of 3.25m. Exceptions to this rule may be necessary when the horizontal curvature of the road would mean buses or large vehicles overrun neighbouring lanes or footways. In such instances the minimum width should be determined by vehicle tracking.

Footways and cycle tracks should both have consistent widths of 2m. The buffer island situated between carriageway and cycle track should be a minimum of 0.5m wide if the island is to accommodate no activity, 1.6m wide (including kerb stone) if cycle parking is to be accommodated parallel to the kerb, 2m wide if cycle parking is to be provided in an echelon style, and 2.4m if cycle parking is to be provided perpendicular to the kerb. Wherever islands are introduced consideration must be given to the available space for people walking, particularly in busy areas.

At crossing locations the island needs to be 1.8m wide to accommodate three full rows of tactile and a 300mm kerb either side. Where this may not be feasible, an alternative width of 1.5m may be considered utilising three full rows of tactiles and a 150mm kerb. At some locations it may be deemed



Splay kerb on segregated track, Ruckholt Road



Segregated track, with protective island, CS2 Stratford

appropriate to control cyclists with the same signals as general traffic. In these instances pedestrians will cross cycle track and traffic lanes in one movement and islands will not be necessary.

### Pedestrian accessibility

Where kerb islands are used to provide protected cycle tracks, consideration must be given to pedestrian access, particularly permeability across the road. Proposals for the route schemes will improve conditions for people wanting to cross main roads in the borough with many more signalised and informal crossing points introduced. The location of crossing points needs to be overlaid onto the typology as the design is developed. There is an aspiration to introduce signalised crossing points every 500m along all main cycle routes (subject to local conditions).

### Conflict between people walking and cycling

There are concerns over the potential for conflict between people walking and cycling when new cycling infrastructure is introduced. The priority particularly at signalised junctions is an area of debate and a series of standard designs are being progressed as part of the design development for Lea Bridge Road.

In shopping areas, near to public transport interchanges and other major generators of pedestrian traffic, priority should be given to pedestrians and people cycling and will be controlled by signals similar to general traffic. However, a general rule of thumb to be applied is to provide priority to pedestrians in areas where footfall exceeds those cycling and vice versa. It should however be remembered that the amount of times a cyclist has to stop and start greatly effects the level of comfort and excessive stopping and starting should be avoided.

Using coloured surfacing to highlight the cycle track to people on foot may also reduce the risk of conflict between people walking and cycling in busier locations.

### Accessing the cycle tracks from side roads

The redesign of the main roads in the borough as part of the Mini-Holland Programme aims to regulate the places that people who cycle join the segregated tracks at parallel signalised pedestrian and cycle crossings. Most side roads that are closed to general traffic will still be open to cyclists through the introduction of modal filters. The only exceptions to this may be where the side road entrance is closed to facilitate a bus stop or loading provision and it will not be possible to introduce cycle permeability due to potential for conflict with other road users.

There is an aspiration to introduce signalised crossings that allow pedestrians and cyclists to cross vehicular carriageway, and these will be introduced at minimum intervals of 500m. Informal crossing points and breaks in segregation will be introduced at some junctions to enable more confident cyclists to enter tracks at these locations, but the segregated route via signalised crossing will be highlighted to less confident cyclists.

In some instances this will mean people on bikes may have to travel in the 'wrong direction' initially to their aspired direction of travel. This will however mean that cyclists have controlled access to tracks that do not involve conflict with vehicles or pedestrians.

### Materials

Cycle track material can take two forms in this location; either asphalt based surface or large setts. If the asphalt surface is chosen, then it should be at a different level to the footway and segregated from the main carriageway.

The use of coloured asphalt or coloured chippings within the top layer of the HRA could also be considered. In sections the cycle track may be constructed from permeable conservation paving units or similar.

A stretcher bond should be used at all times with bespoke cycle symbol paving slabs (or bespoke route making slabs) to be evenly placed throughout the route.

## Drainage

Sustainable forms of drainage should be introduced wherever possible. This may take the form of permeable paving, rain gardens or pocket parks and SUDS in areas around side roads or parking and loading bays.

For the street typology as a whole, drainage should be directed to standard gullies located within the carriageway where it is not being captured by SUDS. Where possible the cycle track will be raised from the carriageway by approximately 75mm and such a suitable cross fall should be achievable to allow runoff from the footway and cycle track to enter the general carriageway drainage system.

## Parking and loading

Parking and loading will be provided in bays within the island where deemed appropriate and where the spatial arrangement can be accommodated. The bay should be a minimum of 2m wide with a minimum door zone of 0.6m on the cycle track side. Parking and loading bays should be provided at carriageway level and not raised to footway level. This will reduce overrun on to the door zone and make access and egress from vehicles easier. The parking mix (provision for different types of parking) is discussed in a later section of this document.

## Lighting

Lighting for the Urban Connector typology should be urban in style, utilising a modern stainless steel or grey powder coated finish and be in-keeping with the borough's street lighting and design guide. Due to the width of the separator island it will be unlikely that columns can be erected on the island and the costs associated with the relocation of power supply for this may also be prohibited.

Lamp columns should be positioned at the front of the footway. As stated in the LCDS, where cycle infrastructure is located next to columns rather than general traffic lanes, the offset can be reduced from the normal 450mm to 250mm.

## Planting and landscaping

Utilising the island between the carriageway and footway for planting and landscaping will aid the visual shift in the environment so accentuating a new cycle friendly environment. Planting on urban connector sections can be introduced in planters on top of the kerb island or into the island in wider sections. This distance between planters can be amended to suit localised requirements be that lighting, parking and loading or street furniture. No shrub planting should be considered other than at the end of stopped up roads or areas of planting adjoining the public highway.

## Street furniture

As per lighting options, street furniture should take a more urban approach compared to the rural routes. Stainless steel bins, steel and timber seats or other contemporary designs with matching bollards should be utilised that are in keeping with the borough's streetscape guidance.

# High Street

Taking our inspiration from cycle tracks present in many major European cycling cities, our design principle is to create fully segregated cycle tracks wherever feasible, raised from the carriageway. Wherever possible, cycle tracks will go behind parking and loading bays and bus stops to create an uninterrupted route for cyclists.



Visualisation of High Street typology with greening and parking



Stepped cycle track with bus island in Copenhagen, Denmark

## Spatial dimensions

The spatial design of the High Street typology is the most challenging due to the competing demand for space and the narrow width between building frontages. However, minimum widths of provision for pedestrians, cyclists and vehicular traffic including bus lanes will be maintained throughout (as shown in the visualisation below).



Visualisation of Narrow High Street typology with greening and bus lane

Where possible, the standard widths of 3.2m traffic lanes and 2m footways and cycle tracks should be introduced. Continuity in width should be applied throughout designs, and where cycle tracks have to reduce in width due to limiting factors, this should be done gradually and be sympathetic to all types of cyclists.

The visualisation above shows an alternative High Street typology with a narrow island. Where road width is further limited, the island can be omitted creating a stepped track similar to those in place in many European Cycling cities and in fact already in place on Orient Way, Waltham Forest. Kerb edging introduced between the track and the higher footway level should be a 45 degree splayed kerb to ensure comfort and minimise the risk of pedal strike.

## Materials

Material and street furniture choices for the High Street typology should be the same as the Urban Connector typology. This consistent approach will provide greater continuity and understanding of cycle priority and will create a more coherent street scene throughout the borough. Cycle track material can take two forms in this typology; either asphalt based surface or large setts. The asphalt surface will be the most widely used. Whilst it is desirable to reduce the number and type of materials used in one area to not cause clutter, the use of dark coloured asphalt creates a visual impression that the motor vehicle is the dominant form of movement.

## Drainage

Sustainable forms of drainage (SUDS) should be introduced wherever possible. This may take the form of permeable paving or local pocket parks or rain gardens and SUDS in areas around side roads or parking and loading bays.

For the street typology as a whole, drainage should be directed to standard gullies located within the carriageway. Where possible, the cycle track will be raised to from the carriageway by 50- 75mm, and such a suitable cross fall should be achievable to allow runoff from the footway and cycle track to enter the general carriageway drainage system.

## Parking and loading

Parking and loading provision will either be accommodated in bays located on the carriageway (see visualisation) or in bays located at the end of stopped up roads (see sketch below). In both instances a minimum door safety zone of 0.6m should be incorporated through the use of a double kerb (300m x2).

A 75mm upstand should exist between parking or loading and the cycle track. The track behind loading bays should be at grade with the footway to aid delivery drivers crossing with goods.

Parking and loading can also be accommodated in floating bus stop extensions. The following example shows how a standard side road entry treatment, floating bus stop and parking and loading can be accommodated within one urban block. To provide adequate space for pedestrians and cyclists, bus stops in urban locations will rarely be accommodated within a bus bay. Their location in the running lane will mean traffic must wait for an adequate gap to overtake a stationary bus.



Inset loading bay in junction of closed road with segregated cycle track



Existing inset parking bay with segregated cycle track, Orient Way

### Alternative uses of space provided

Whilst working with businesses on developing proposals for parking mix, alternative uses of the space should be considered. If parking is not in place outside businesses the additional 2m road width can be allocated to different uses. This could include outdoor seating or areas to display goods. This should be discussed with the local community during the design development process.

### Parklets

Parklets are in effect parking spaces that are converted to other uses. The use of Parklets are commonplace throughout American and European cities to soften the street environment and provide space for people to rest while shopping or outdoor eating. There will be opportunities to introduce Parklets as part of the amenity, parking and loading mix on corridors.

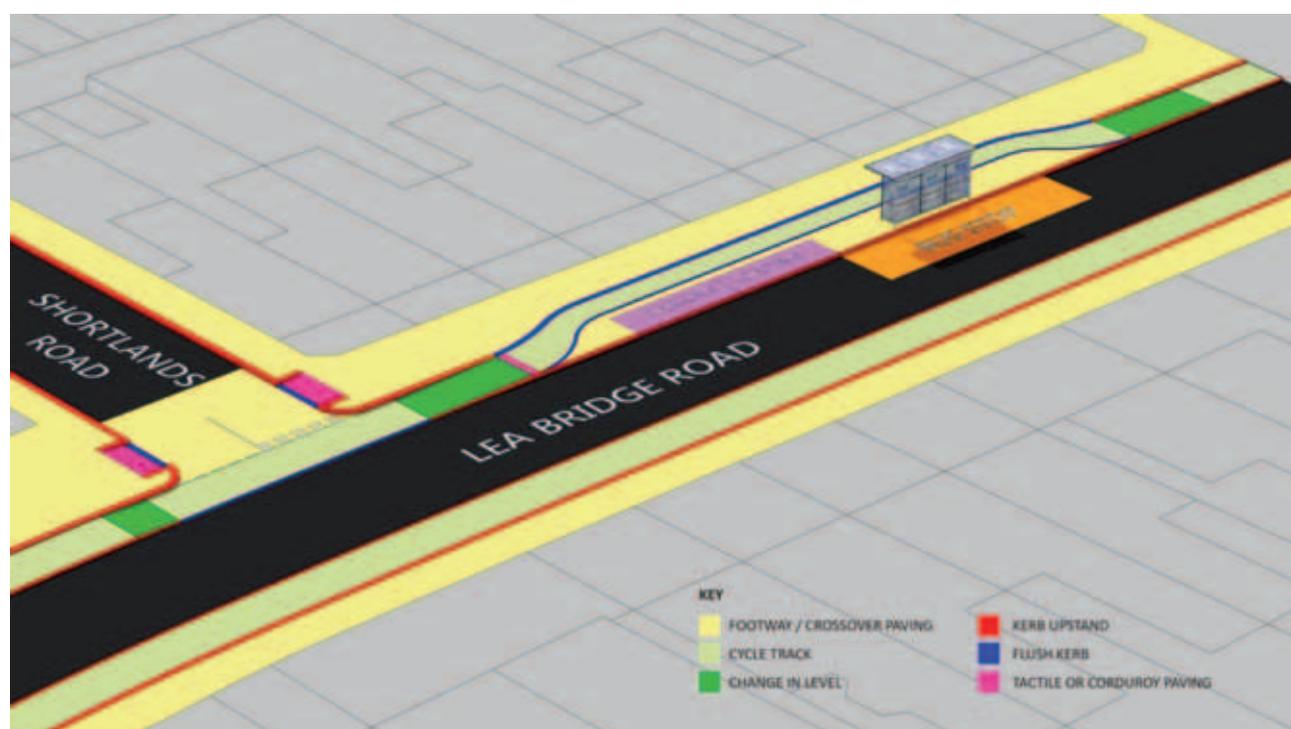
Parklets are normally introduced as semi-permanent features on shopping streets in place of existing parking bays. With the wholesale changes to road space that will be made as part of the introduction

of the Mini-Holland Programme, there will be opportunities to introduce these as permanent features.

It may however be of benefit to consider the use of temporary Parklets. This would mean that a permanent location would be created for a Parklet in the street design but the make-up of the Parklet could be altered to suit local traders and weather etc. meaning the space would become multi-functional. This may be particularly relevant in side roads off the main corridors where they could be used as part of the villages and town centres.



Parklet in San Francisco



## Lighting

Lighting in this street typology should be provided consistently at the front of footway. Exact locations will require site surveys and detailed lighting design, particularly to mitigate the impact of tree planting on lighting and safety.

Placing the columns at the front of kerbs on the footway will provide aesthetic consistency but will also mean costs associated with new ducting are not prohibitive to the scheme progressing.

## Planting and landscaping

Due to the competing demands for space, the opportunities for either tree or shrub planting will be limited. It is therefore vital that any opportunities such as the end of stopped-up roads or on parking and loading islands should be designed to the highest standard and provide the maximum amount of environmental and aesthetic benefit.

Landscape plans should be developed in partnership with green space, architects, local stakeholders and the engineering design team to ensure no opportunities are missed and that planting helps shape the character of the street typologies. Locations for pocket parks (small green areas within the urban environment) have been identified during the development of the concept designs for each route.

Additional locations for planting can be achieved through the use of Parklets (see above) and by building upon local traffic management schemes included within the overall proposals.

## Street furniture

As per lighting options, the introduction of street furniture should take a clean urban approach in keeping with other recent public realm improvement schemes. Stainless steel bins, steel and timber seats and matching bollards should be utilised.

# Cycle lanes

On most of the main roads in the Mini Holland area, a higher level of service from either segregated or semi-segregated cycle tracks will be introduced as part of the programme. It may be that on secondary and feeder cycle routes cycle lanes are proposed. The following section provides some guidance on the use of the differing types of cycle lane, their uses and limitations.

## Mandatory cycle lane

Mandatory cycle lanes are used on wider roads and assist by separating people on cycles from motor traffic. They are usually a minimum 1.5m wide. At any time enforcement for vehicles parking or driving in mandatory cycle lanes is possible and creates a safer environment for cyclists.

Limitations of mandatory cycle lanes are associated with both perceived (subjective) and actual road safety. The cycle lane and indeed anyone on a cycle in it is only protected from nearby vehicular traffic by a white line. This is a low level of protection and raises subjective safety concerns which put people off cycling, particularly less confident or new cyclists.

The space and people cycling can however be afforded additional protection by using semi or light segregation solutions which are discussed in the following section.



Costs for mandatory lanes vary considerably depending upon the length of route starting at £1,500 (plus consultation costs) for a mandatory lane lead in at traffic lights. They are very cost effective ways of providing space for cycling when conditions are such that people driving vehicles will obey the designation of space and there is adequate enforcement to ensure compliance.

## Advisory Cycle Lanes

Advisory cycle lanes allocate an area of road space to people cycling. The marking indicates to other road users that the space is allocated to people cycling. Motor vehicles should avoid entering these lanes but are permitted to do so if needed. Because motor vehicles can enter advisory cycle lanes they provide a low level of service for people cycling and will be unlikely to encourage less confident cyclists.

Advisory lanes effectively tell cyclists to travel down the inside of vehicles which can feel and potentially be dangerous, particularly on the approach to junctions.

Parking restrictions are often part-time in locations where advisory lanes are in place, meaning the lanes are effectively useless outside of peak hours.



The introduction of advisory lanes are not recommended unless in locations where traffic volumes and speeds are within reasonable parameters and lanes at least 1.5m wide (preferably 2.0m) can be introduced with adequate protection from people parking vehicles in them.

Where parking is existing or to be introduced consideration should be given to minimise the risk of door strike. The advisory lane should be wide (at least 2m) or with a marked buffer zone (0.5m) to reduce the risk of people cycling being struck by people opening car doors.

Designers should always try to introduce mandatory lanes and should only use advisory lanes where necessary due to limiting factors such as available road space. This is however where issues with advisory lanes occur as there is not enough space to provide for all road users without making compromises. These compromises normally mean people on cycles sharing space with motor traffic.



# Alternative segregation

Alternatives to full segregation (commonly known as light or semi segregation) are the subject of debate, amongst transport practitioners, people who cycle and other road users, as to their effectiveness and whether they provide space for cycling that is safe and equally important when trying to encourage more people to cycle.

The first real examples of semi segregation in the UK have been in place for one to two years but there are many other examples in mainland Europe and beyond. The recently published London Cycle Design Standards includes the use of semi segregation and detailed specification of features such as armadillos.

The use of semi and light segregation is also included in Transport for London's recent report on international best practice in a number of urban environments. Transport for London have produced a technical note on alternative segregation solutions called 'TfL Light Segregation Note- July 2015'.

## The use of semi or light segregation in Waltham Forest Mini-Holland

Whilst the typologies included within this design guide are to be used throughout the flagship Lea Bridge Road route and Forest Road, there are some locations on the north-south routes and other locations where the use of other forms of segregation may be used.

The yardstick that is often applied to this and one which should be considered through the design of the Mini-Holland Programme is the eight year old test. This simple subjective decision effectively asks the designer whether the cycle provision proposed would enable and encourage all people from the age of eight to feel safe cycling.

This test should be applied to all design for the Mini-Holland Programme and particularly where the use of light or semi segregation is being considered.

Factors that should also be considered include existing traffic conditions, types of vehicles using the carriageway, vehicle speed and kerbside activity (loading, servicing and parking).

The successful Mini-Holland bid includes the use of semi and light segregation on sections of the Leyton to Blackhorse Road and Leyton to Chingford routes. Their use on these routes was selected for a number of reasons which are outlined in the following overleaf.

## In locations of limited available road width

The use of light or semi-segregation in these locations (with wider spacing) enables faster cyclists to overtake slower cyclists by entering the vehicle lane to overtake and then re-joining the semi segregated cycle lane through spaces between features.

## Financial constraints

Whilst the £27 million funding enables the Council to introduce a coherent joined up network of space for people who cycle, the network provided can be widened massively through the use of semi or light segregation where this does not compromise actual or perceived safety.

Cycle routes provided using semi or light segregation require less civil works such as drainage or the moving of statutory undertakers equipment which can mean schemes are cost prohibitive.

## Construction time

Semi or light segregation can be implemented far quicker than full segregation because of the reduced requirements around physical works, meaning a network can be expanded much more rapidly.

## Temporary or experimental road space reallocation

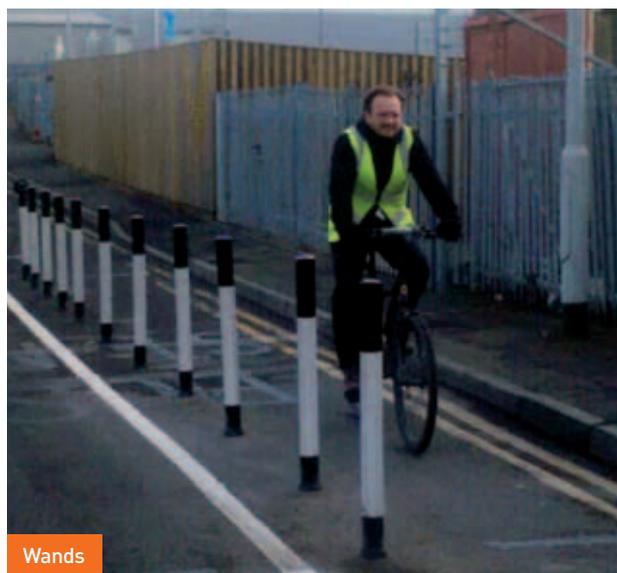
Another reason for the possible use of semi segregation is to provide space for cycling on a temporary or experimental basis. This may be to provide an opportunity to assess the impact on all traffic before permanent changes are made or to provide temporary allocated space for people who cycle prior to or during construction.

## Types of semi or light segregation

As part of the design development for the programme the Council has conducted a trial of a number of light or semi segregation materials at Low Hall Depot. The following section details the different types of semi segregation, their specification and a summary of feedback on each example.

### Wands

Deformable posts or ‘wands’ as they are known are available to provide lane segregation. The posts deform or bend when struck and designed to rebound 1000 times. They are available in 800mm heights in 80 or 130mm diameter with anchor fixings. Manufacturers state they are robust, hard wearing and require no painting.



Wands

It should be noted that these features would provide little or no protection from vehicles incurring into space allocated to cycling and are a visual rather than physical deterrent.

This means that their suitability as a light segregation feature on their own should be carefully considered. However, their use in combination with other features, to mark the commencement of sections of semi or segregated space for cycling is an option that can be considered.

### Armadillos

Armadillos are the most commonly known light segregation solution in the UK, having been introduced in Royal College Street Camden and in Salford, Manchester, but much more widely in Europe.

They are made from recycled PVC and available in heights of 50, 90 and 130mm. Armadillos provide separated space for cycling from general traffic but are still semi permeable.

Whilst this has raised concerns from people who cycle regarding the protection afforded as secondary to full kerb construction they do enable cyclists to enter and exit the protected space through gaps and can be installed at a fraction of the cost of fully segregated space.



Armadillos



Orcas

### Orcas

Orcas are similar to armadillos except they have a straight profile on the outside. This may make them more of an obstacle for vehicles at risk of straying into the cycle lane but may also not be suitable for locations where cyclists may wish to enter and exit the cycle lane into general traffic.

### Cycle lane defenders

Cycle lane defenders can be used to provide continuous or light segregated space for cyclists. They are made of recycled rubber tyres and unlike other light segregation solutions can provide continuous sections of segregated space. If used to provide continuous segregation, crossing points for pedestrians and vehicular access to side roads, driveways and entrances would have to be considered as part of the design process.



Cycle lane defenders

### A combination, the best solution

It may be that using a combination of light or semi segregation features is the best solution in many locations. Feedback from people who have visited the trial in the council depot suggest that the wands give a sense of separation that smaller features such as armadillos do not.

It should however be remembered that they are only really a visual separator and as such it may be preferable to use them in conjunction with other features that are more of a physical deterrent to vehicle incursion. Forms of light segregation are often used in combinations as seen in the photo of wands and armadillos in Barcelona (right).

## Monitoring effectiveness

The use of any light or semi segregation measures needs to be monitored post implementation. In locations where semi segregation has been used in the UK maintenance has been an issue and critics have highlighted safety concerns around dislodged features in the cycle track and general traffic lanes.

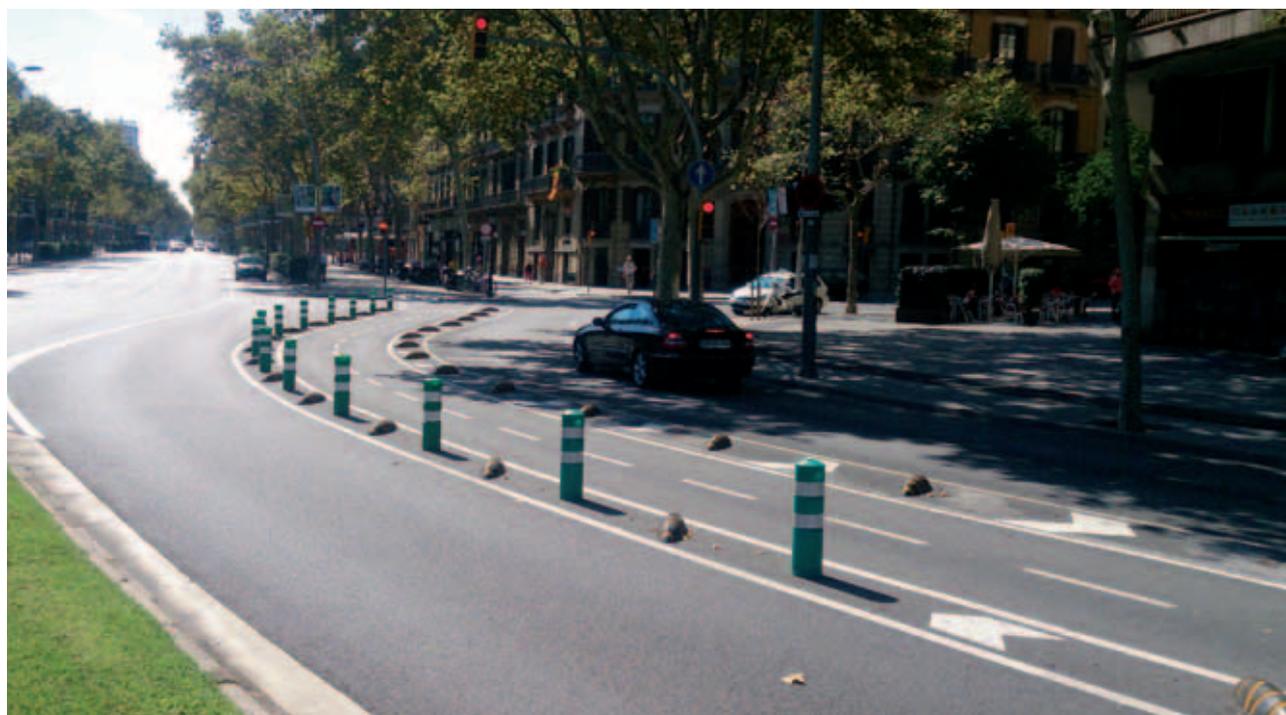
It should however be noted that in both cases early versions of the armadillo have been deployed and this should not mean that the use of all forms of semi segregation are dismissed. It is also unclear what maintenance and inspection regimes are in place at these locations.

## Secondary cycle routes

Secondary cycle routes are those that will provide the network within the village and town centre areas. They will play a vital role in providing interconnectivity between the residential areas and act as feeder routes to the main cycle route network. They will be made suitable for cycling by the removal of through traffic by the introduction of modal filters and other traffic management features.

Other key features and characteristics that secondary cycle routes should have include (but are not limited to):

- Cycle friendly traffic calming (sinusoidal humps)
- Pinch points such as traffic islands removed
- Parking restricted near to junctions
- Tight junction geometry to ensure low vehicle speeds
- Cycle parking near to shops and other places of interest
- Wayfinding and signage
- Planting and greening



# Junctions

## Major junctions

All major junctions on main cycle routes will require some level of redesign to allow the safe movement of pedestrians and cyclists. Junctions and turning movements are one of the main locations and causes for collisions involving cyclists. As well as being dangerous locations for cyclists, major junctions are also psychological barriers to less confident cyclists.

It is essential to separate cyclists from motor vehicles at junctions to remove the potential for conflict with vehicles. Whilst standard typologies for the corridor have been developed, standard typologies for major junctions have not been developed as part of this guide.

Many of the major junctions in Waltham Forest, particularly on Lea Bridge Road are offset (their arms are not symmetrical). Traffic flows also vary considerably so a one size fits all will be unlikely to be possible. There are also varying levels of pedestrian flows which may present both issues and opportunities.

The latest version of the London Cycle Design Standards has a series of approved junction designs which may be applicable to the main junctions in the borough. Whilst this design guide has been produced to assist in the design process there are a number of assessment tools in the LCDS guide which should be applied to the project. Prior to commencing work on any junction design, the junction assessment tool from the LCDS Cycling Level of Service should be applied to assess the junction. As the major junctions will be linked by segregated or semi segregated cycle tracks, segregated space at junctions for cyclists will be provided wherever feasible.

Major junction geometry should be tracked using a pantechonicon vehicle or a 12m bus. Careful attention should be paid to ensure cycle routes through junctions and footway space are not compromised to facilitate large vehicle turning movements. Consideration should be given to the possibility

of banning vehicle manoeuvres if the numbers of vehicles turning can be demonstrated to be low and can be redirected through the network. This will eliminate the cyclist conflict zone and improve signal timings to account for extra cycle signal stage.

## Cycle routes through junctions

Cycle routes through junctions should be designed to highlight the route through the junction to the adjoining dedicated cycle space on the other side of the junction. It is imperative these routes are simple, direct and do not encourage movements that could result in conflict.

It may be of benefit to use coloured surfacing in addition to 'elephant footprints' to highlight the routes for cyclists through junctions. The visual impact of using coloured surfacing on the overall street aesthetic should however be considered as part of the design development process.

## Cycle signals

The introduction of eye level dedicated cycle signals has two major benefits. Firstly, at complex junctions they act to reduce confusion relating to when cyclists should or shouldn't be moving. Secondly, these lights offer the opportunity to introduce separate cycle stages within a junction or allow early release of cyclists through the junction. Wherever feasible cyclists should be afforded separate cycle signal stages and TfL are currently engaging with the DfT about the approval of use for these signals.

## Cyclists green wave

A cycle green wave relates to the use of cycle signals. The design concept is that cyclists are given a continuous flow through a linked number of junctions to alleviate stop and start movement along specific corridors.

An additional feature for cyclists on the approach to major junctions are additional green wave lighting in the form of LED strips on the approach to signals which go out as the 'green time' on the signals is running down (similar in nature to pedestrian countdown).

It advises cyclists that they will or won't make the cycle green time at the lights and can adapt their cycling speed accordingly.

This simple feature is valuable for cyclists (stopping and starting uses more energy) and also reduces the likelihood of conflict at traffic signals with other road users.



Approach to signals for cyclists (green wave) lights on edge of cycle track)

## Side Roads

Side road geometry should be narrowed to the smallest possible width, with turning movements assessed based on a refuse vehicle. To encourage slow and safe turning movements across the cycle track, the use of a bollard (or similar) could be considered on the outer edge of the cycle track.

The design of junctions should be such that they prioritise the movement of pedestrians and cyclists. Cycle tracks particularly should not be terminated at side road junctions or accesses to properties. Where there is a risk of vehicle incursion through taking corners too tightly the use of bell bollards or similar should be considered. The placing of the bollards should be carefully considered to ensure they are not an obstacle to pedestrians and cyclists.

### Copenhagen or Blended crossings

Copenhagen or blended crossings are side road entry treatments that visually read as a continuation of the footway. They should be considered at gateways to residential areas and locations where segregated cycle tracks forming part of the wider network pass side roads within the villages or town centres.

Unlike side road entry treatments which have a kerb edge running perpendicular to the main carriageway, blended crossings do not. To be seamlessly incorporated into the streetscape the footway and cycle track will have a slight cross fall down towards the main carriageway whilst crossing the vehicular entrance but with a steeper ramp outside the path of the cycle track for vehicles entering the side road. This change in height will slow vehicles down and warn drivers they are crossing a cycle track and the pedestrian desire line.

### Side road entry treatments

Entry treatments are junctions where the carriageway is raised to footway level to act as a speed deterrent for vehicular traffic and to provide a level crossing point for pedestrians travelling along the main road.



Blended or Copenhagen crossing, Hoe Street



Blended crossing with segregated cycle track, Amsterdam

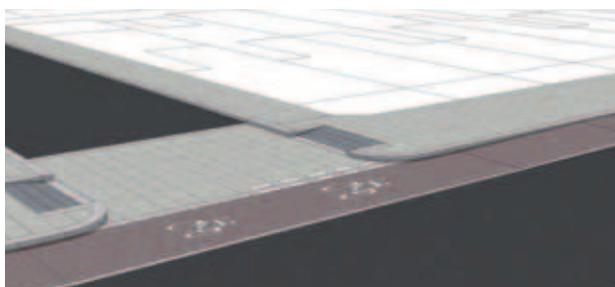
This can be done using a wide range of materials to either just act as a speed deterrent or highlight the area as a pedestrian crossing location.

Side road entry treatments are an alternative to Copenhagen crossings. They should be introduced where it is felt Copenhagen crossings will not be appropriate due to the location, traffic volumes, or driver behaviour. The use of materials other than asphalt will have a greater impact on driver behaviour and the use of alternatives such as blocks or setts should always be considered.

### Carriageway level standard side road

In some circumstances along the cycle route it may be deemed appropriate to use a more standard side road entry treatment at carriageway level. If the cycle track is raised in these locations then a ramp down and a ramp up must be provided. These ramps should be approximately 10m in length so the gradient has little impact on the cyclist.

Line markings for the side road should be set back in line with the footway kerb and at least two large cycle symbols placed on the cycle track directly in front of



Visualisation of side road with cycle track at grade

the junction. Footway material should also be utilised within the carriageway surface of the junction.

### Green link set back cross over

Side roads in some locations (mostly rural typology streets) have cycle tracks set back from the carriageway and footway behind a buffer. In these locations side road entry treatments should be raised to footway or cycle track level and give way markings introduced.

The material(s) used within the footway and cycle track should be used for the entire side road treatment up to and including where the cycle track crosses the side road. This will reduce the impact of large expanses of asphalt and warn drivers they are entering an area with pedestrian and cycle movements.

In order to provide the best possible provision for pedestrians, any opportunity to bend the footway back from the main carriageway so pedestrian desire lines are not blocked by vehicles giving way to cyclists.

### None Signalised Raised junctions

Raised junctions can be considered to be the next step on from a raised side road entry treatment or



blended crossing. Rather than simply raising the side road, the area raised includes the main road running perpendicular to the side road. This is a common way of reducing vehicle speeds and creating a nodal feature.

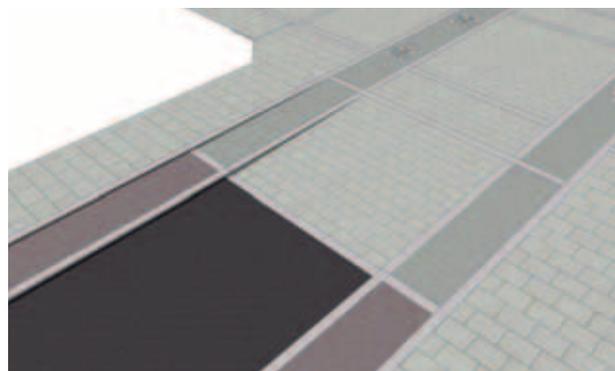
In such instances where it is felt a raised junction should be implemented a design should be produced which both makes all users aware of the nodal nature of the space, adds a sense of shared space, but also continues to provide demarcation between carriageway and cycle track. The example below shows how a blended crossing can be expanded into a raised junction with continued demarcation but with significant aesthetic improvements.

### Side road closures

Side road closures will be introduced along the network of primary cycle routes. Previously known as cycle permeability treatments, modal filters will likely be the most common type. They involve the closing of side roads to vehicular traffic but with access maintained for people walking and cycling.

Closing side roads to general traffic reduces the locations where turning vehicles can conflict with cyclists using the route. When proposed as part of a route consideration should be given to both the positive impact this may have on the road in question and the potential impact on neighbouring roads.

All modal filters should have a minimum clearance for cycles of 1.5m. Whilst from a comfort perspective it may be of benefit to introduce wider filters, the ability for small motorised vehicles to illegally use any filters must be a consideration during the design of any such features. Modal filters including examples are discussed in the following traffic management section.



# Traffic management

## Shared space

Shared spaces are the subject of discussion amongst the transportation industry and transport user groups. There are many examples in the UK where shared space treatments have addressed a number of transport issues and improved the environment for road users. There are however other examples where shared spaces have been less well received, particularly in cases where traffic volumes are high.

They can be a great treatment for small shopping areas if the right conditions (low traffic and low speed environments) are also in place. They can also be introduced as gateway features to residential areas or in large open junctions. The pictures below illustrate the transformation of Venn Street, Lambeth through the introduction of a shared space treatment.

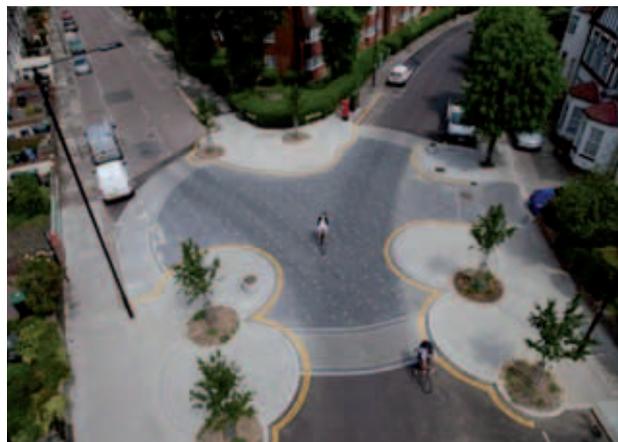
The required conditions can of course be created using other traffic management measures such as modal filters or banned turns.

Shared space treatments can create issues for people who are visually impaired due to the lack of delineation and other guides. It is therefore vital to ensure that shared space treatments are only introduced in the right locations.



Shared space with modal filter, Leytonstone Station





### Modal filters

Modal filters can effectively be mini public realm schemes and cost between £10,000 and £30,000. The same traffic management effect can be achieved using a few well-placed planters or bollards.

It is important when designing modal filters that access for people walking and cycling is maintained and improved. Gaps for people on cycles should be at least 1.5m wide to enable all types of cycle to use them. Pedestrian routes and footways should also provide clear easy to navigate routes and where possible the opportunity should be taken to provide an at grade crossing point. Transition from any adjoining cycle networks should be seamless with no sharp corners and free of any kerb upstands.

Aside from these simple rules modal filters can be located at various places in streets and in various shapes and sizes. The next section shows a number of examples.

### East Avenue Bridge, Walthamstow Village

Closing bridges in residential areas to motor traffic is a great way to reduce traffic volumes in residential areas and improve the environment for all. Because these bridges are normally across railway lines or canals closing just a small number of roads provide benefits for wide residential areas. Due to the fact they have no claim for the road space on them for parking or other uses they can easily be transformed into new public spaces once closed.

The image right shows East Avenue Bridge, Walthamstow Village which was closed to traffic as part of the final proposals introduced after the trail closures in 2014.

### Haringey Gardens

Introduced as part of a wider traffic management scheme this modal filter includes small areas of landscaping and tree planting.

Whilst the planting areas are well constructed and planted opportunities to introduce sustainable drainage have been missed.

The modal filter is however well designed with gentle gradient and wide access allowing all cycles to easily use the filter.





### Powerscroft Road, Hackney

The Powerscroft Road scheme was introduced as part of a scheme to reduce rat running in the Millfields area and create better conditions for people cycling along the Powerscroft Road quiet route. The scheme includes a modal filter that still permits cycle access with public realm improvements that reduced the road space and tree screens and planting to add greening.

### Essex Road, Walthamstow

Introduced as part of a traffic management scheme to prevent industrial traffic travelling through a residential area. The modal filter enables people cycling to access the road which serves as a quiet route to central Walthamstow and Chingford.

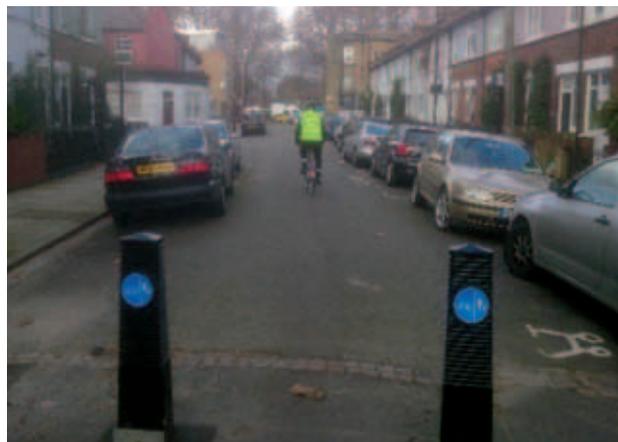
Whilst relatively well designed the narrow routes through (circa 1m wide) may cause difficulties for anyone with specialist cycles.

### Two-way modal filter, Southgate Road, Hackney

The two way modal filter in the image (below) is in place at the junction of Englefield Road and Southgate Road in the London Borough of Hackney.

It is part of a wider traffic reduction scheme in De Beauvoir Town which has successfully removed non local vehicular traffic from the area improving conditions for those choosing to walk or cycle.





### Street, Hackney

This modal filter has been introduced using just two removable bollards to prevent motor vehicular access but still allow but still permits people on cycles to access Millfields Park.

This low cost option provides all the traffic management benefits of modal filtering at a fraction of the cost of kerb construction etc.

However it does little for the public realm in the road and an opportunity to add planting or reclaim space for people has been missed.

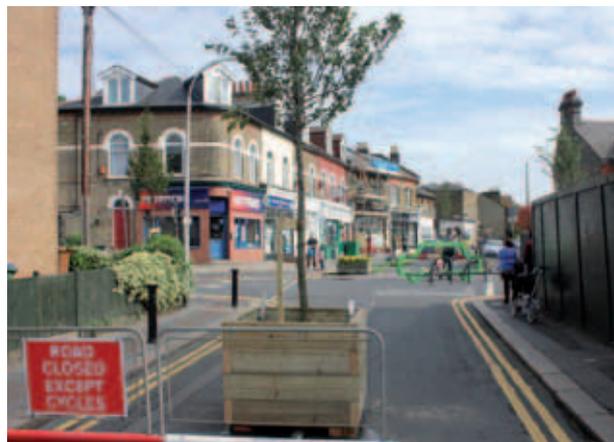
### Modal filters using temporary materials, Walthamstow Village

As part of the Walthamstow Village pilot scheme road closures were successfully trialled using a variety of temporary materials.

The photo on the left shows a way modal filter at the junction of Grove Road and Pembroke Road introduced as part of the pilot road closures using trees in planters.

This approach has proven to be a low cost means of closing roads either experimentally or in response to an urgent requirement to amend traffic movements.

The use of temporary materials to introduce experimental road closures can also be a robust approach to introducing closure where local residents or businesses have concerns about the impact of the



proposal. Closures can be trialled for periods of time to assess their impact on all road users.

### Road closure with public realm improvements, Leytonstone

This road closure, introduced in Southwell Grove Road as part of the Leytonstone High Road corridor scheme includes additional tree planting, a dropped kerb for considerate cycling and the closure has also facilitated the introduction of a new pedestrian crossing on Leytonstone High Road.





### Road closure with bus stop, Marvin Road, Hackney

The photo left shows a road closure on Marvin Street, Hackney which has been used to facilitate a larger waiting area for bus passengers. It should be noted that no provision has been provided for people on cycles to access Graham Road through the closure.

This may be due to concerns about conflict with people waiting for buses but it may have been feasible to accommodate both.

### One-way streets

One-way streets can be an effective way to deter rat running through residential areas. They are however often faster than two-way streets and unless contraflow cycling is allowed make using a bicycle less attractive.

When considering the introduction of one-way streets designers should consider additional speed reduction features and the opportunity to permit contraflow cycling.

### Contraflow cycling

Contraflow cycling is where people cycling are permitted to travel against the flow of traffic in one way streets either in the main carriageway or in a segregated lane.

When the potential introduction of contraflow cycling is being considered in a street it is important to consider whether there is adequate room for cycles and motor vehicles heading in the general direction of traffic to pass each other safely.



It may be that this can be facilitated by the introduction of passing places. It is however important to remember that introducing contraflow cycling in places where there is not sufficient road width will likely lead to conflict between people cycling and driving cars.

In the picture above a former two-way road has been converted to one-way with contraflow cycling permitted. A cycle lane has been provided with a door zone to protect people cycling being hit by people opening car doors. Cars are however driving very close to the contraflow lane and larger vehicles would likely encroach into the cycle lane.

### No entry road closure with contraflow cycle access, Dalston

The picture (below) shows the junction of Navarino Road and Wilton Way in Dalston where a former two-way road has been converted to one-way but with the addition of contraflow cycling.

As seen in the picture the reduced traffic levels and dedicated space enables people of all ages and abilities to cycle.



# Speed reduction measures

## 20mph

20mph speed limits are becoming the norm in residential areas, particularly in London. As with many new measures the validity of the introduction of 20mph speed limits have been questioned by road user groups with a mixture of support and opposition.

There are two main approaches to introducing 20mph speed restrictions, namely 20mph zones and 20mph limits. 20mph zones are areas of residential roads in which signage combined with traffic calming (speed humps, raised tables and cushions) have been introduced to address excessive speeds in residential roads. 20mph zones must have speed reduction features and signage throughout. They can be relatively expensive to implement so an alternative approach namely a 20ph speed limit was introduced as an alternative in 2012.

20mph speed limits are a similar treatment and must be self-enforcing but have a less prescriptive requirement for traffic calming providing they are self-enforcing through a combination of signage and measures. The lower costs associated has meant that this approach is now widely adopted by local authorities.

In Waltham Forest there are a number of existing 20mph zones and the Council has a commitment to introduce 20mph limits in all residential roads that are not part of an existing zone in the three years from 2013/14. The programme, which began in 2013, has already successfully introduced a blanket 20mph speed limit in all residential roads south of Lea Bridge Road and is currently consulting on roads to the north of the North Circular Road (A406).

## Traffic calming

Traffic calming is a vital tool to address traffic speeds, driver behaviour and allay road safety concerns particularly in residential areas but should always be introduced in the right places and to the benefit of all road users. Whilst some features are implemented

with good intentions they can adversely impact other road users. The following section discusses different types of traffic calming, where they can be implemented and issues that should be considered during the design process.

Whilst the introduction of new traffic calming features is likely to be a common theme in the village and town centre areas in some instances it may be feasible to remove existing features in areas where road closures will create low speed and low traffic environments, particularly in roads that have effectively become cul-de-sacs through the introduction of modal filters.

## Sinusoidal speed humps

Sinusoidal speed humps are a special profile of hump that is more forgiving to road users, particularly those who cycle. Sinusoidal speed humps are the standard speed reduction measure in Waltham Forest and should be used throughout the Mini Holland project. They should also be introduced as standard wherever existing speed cushions are in place.

## Speed tables

On bus routes longer speed reduction features such as speed tables may be necessary to reduce the impact of the vertical deflection on comfort and safety of passengers. This should however be considered on a location by location basis as longer raised sections of carriageway do not always have the desired impact on vehicle speeds.

## Speed cushions

Speed cushions are an alternative to speed humps that have often been introduced as a concession to motor vehicles. This has particularly been the case on main roads or emergency service routes. The reasoning is that vehicles with wider wheelbases straddle the features and there is therefore little or no vertical deflection. This includes larger cars and SUVs.



Despite being introduced as traffic calming measures they can in fact create conflict between people on cycles and in cars. Due to the placing of cushions in the centre of vehicle lanes drivers who want to continue at speed can reduce the impact of the cushion by swerving towards the kerb. This of course puts them at risk of conflict with anyone cycling along the same stretch of road.

### Traffic islands

There are numerous traffic islands located throughout the borough, providing informal crossing points for pedestrians or to protect space for right turning vehicles. Whilst both are well intentioned reasons for use traffic islands are dangerous, particularly for people cycling and provide a low level of service for pedestrians.

They create pinch points where drivers will often try to squeeze past cyclists creating potential conflict. They are also isolating for pedestrians, particularly on busy roads.

The function of all traffic islands, particularly those on main roads should be considered as part of the design process and where appropriate replaced with facilities that are friendlier to those on foot or cycle.

### Junction build-out

Junction narrowing through introducing build-outs can slow vehicle speed by making it less easy to navigate around the corner. It also provides improved sight lines and an opportunity to reclaim space for people.

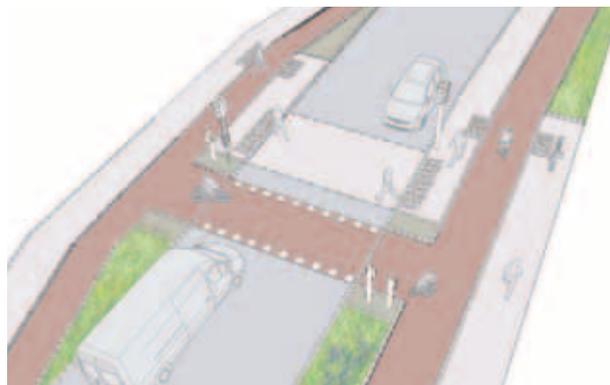
Simple build outs such as those in the photo are a low cost solution and can also provide space for planting or cycle parking.

# Crossings

On many of the key corridors which will be subject to improvements as part of the Mini-Holland Programme pedestrian crossing facilities are sparse and in many instances inadequate. This contributes to the street aesthetic and the suggestion that the main corridors (which are also the main shopping areas) are primarily for the movement of motor vehicles i.e. links not places.

A lack of safe crossing points for pedestrians also affects levels of spending and is therefore detrimental to local businesses. The upgrading of pedestrian crossing facilities along all Mini-Holland routes and the introduction of additional facilities should be central to the development of proposals.

The upcoming revised TSRGD has a number of changes relating to cyclists at crossing. The first key change is that zigzag markings at pedestrian crossings can be offset from the kerb by up to 2m, to allow cycle lanes to continue through the controlled area.



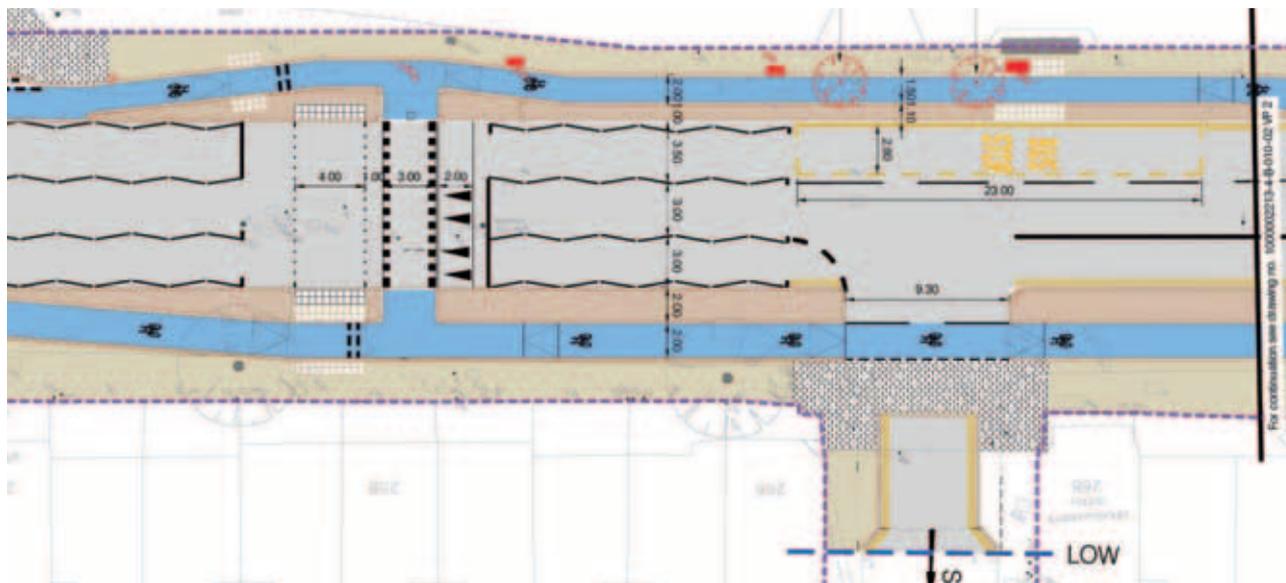
## The Waltham Forest Crossing

As part of the design development for the routes projects a new parallel crossing has been designed in partnership with Transport for London. The design aims to provide signalised crossing facilities for people walking and cycling with connectivity for people cycling into the route network from adjoining residential areas.

In some locations sections of the cycle track will be bi-directional in order to allow people on cycles to get to a crossing point on the track. People walking will have uncontrolled at grade crossing points of the cycle tracks onto kerb islands.

Parallel signalised crossing points are provided for people cycling and walking across the main carriageway.

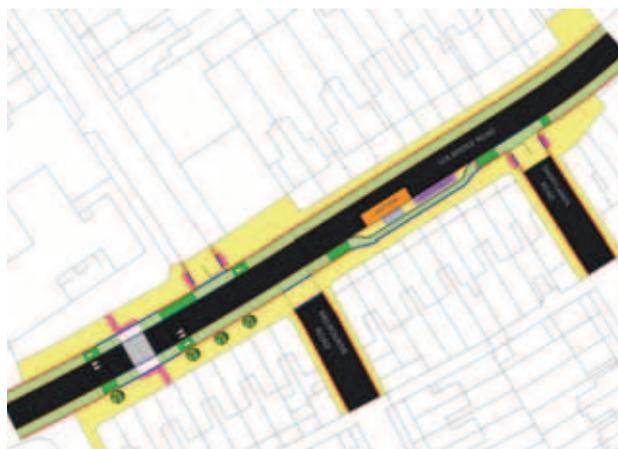
Designers should remember that these crossings are junctions for cyclists and will be busy locations, particularly during peak hours.



Two key points to consider are the radii on kerb islands allow an easy turn on all types of cycles.

Sharp turns particularly on racing or specialist bikes are difficult and that there is adequate holding space for the number of cyclists anticipated to be using the cycle junction.

The sketch design below shows how a new controlled crossing can be incorporated into the street scene along with standard side road designs, a blended crossing design and a floating bus stop.



### Parallel cycle and pedestrian crossings

Shared zebra crossings (pedestrian and cyclist) are in the new draft TSRGD which is due to be published in 2015. This layout requires drivers to give way to both cyclists and pedestrians at the give-way lines.

The Council has introduced two to date, one in Wadham Road and one as part of the new Ruckholt Road segregated route as seen in the picture below.



Shared cycle/pedestrian crossing, Ruckholt Road

# Buses

A reliable, safe and easy to use public transport network is vital if people are to cycle as it provides alternative mobility options for longer journeys or for those who have mobility issues. Public transport is also vital for thriving local economies with many studies showing those who travel by public transport spend more locally than those who travel by car.

## Bus stops

Buses stationary at bus stops can be hazardous to cyclists, forcing them to negotiate around them in general traffic. There are a number of solutions to this issue which should be considered as part of the implementation of the Mini-Holland Programme.

Whilst the aspiration is to provide the highest level of service for those walking, cycling and using public transport in some instances due to compromise on design features due to limiting factors. In these locations designers should ensure that minimum levels of service are provided and that the potential for conflicts are minimised.

## Floating bus stops and bus stop bypasses

Floating bus stops allow safe cycle movements around the rear of a bus stop to avoiding conflict with bus movements. The nature of design means they do create an issue of cycle and pedestrian conflict, but this should always be considered a less hazardous conflict.

The detailed design of floating bus stops should place pedestrian safety as a high priority and consider the following features:

- A wide pedestrian waiting island that can accommodate wheel chair and buggy widths
- Provide at grade crossing points across the cycle track for bus passengers

- Consider hazard paving on one or both sides of the cycle track
- Consider colouring the cycle track if risk of conflict or close interaction



Bus stop bypass, Hoe Street, Waltham Forest



Floating bus stop, Stratford

### Alternative bus stop designs

Where there is not enough road space to provide floating bus stops and segregated cycle tracks then alternative solutions need to be considered.

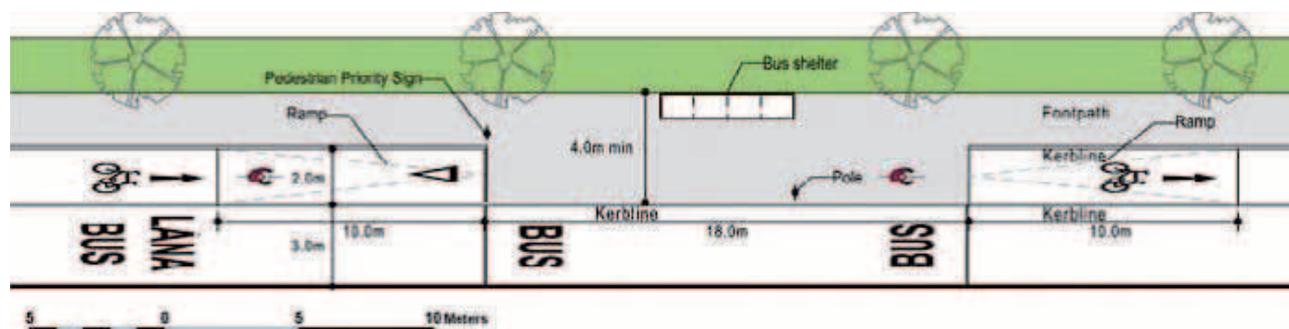
In Denmark where available widths are narrower a bus stop island is provided as seen in the photo left. Passengers cross the cycle track similarly to a floating bus stop bypass and then wait for a bus on the island.

Whilst not preferred, alternative bus stop designs include a pedestrian/cycle shared area in front of the bus stop as shown in the diagrams below from the Irish National Transport Authorities ‘National Cycle Manual’ (<https://www.cyclemanual.ie/>).

This design should only be considered in locations where available width is very limited. The reason this design is not as preferable as a floating bus stop is that it can create potential conflict between cyclists and pedestrians, particularly those exiting buses. If the design is to be considered appropriate signage and speed reduction measures should be considered to deter cyclists travelling at speed and ensure they give way to passengers getting on and off the bus.



Bus stop island, Copenhagen



# Parking and loading

## Cycle parking

Cycle parking is as vital as any other cycle infrastructure. Quite simply if there isn't somewhere safe for people to lock cycles at the end of a journey they will be unlikely to make the journey by cycle. In order to support people cycling more in the borough more cycle parking needs to be introduced in exactly the same places that car parking has always been introduced.

## On street cycle parking

The provision of cycle parking is crucial to the success of the Mini-Holland scheme. A lack of safe and accessible cycle parking can significantly lower cycle usage across the network. Cycle parking should be provided in areas of demand (shops, offices, etc.), nodal junctions, and in regular intervals along key routes. The location should be easily accessible from the cycle track or lane and ideally not require cyclists to cross pedestrian space.

Cycle parking locations should have high levels of natural surveillance and not be hidden by any form of soft landscaping. Whilst many different styles of cycle racks are available, the Council uses a stainless steel Ollerton Fin Steel Cycle rack or the Sheffield style cycle rack.

Opportunities to introduce architectural cycle parking should not however be dismissed, particularly if this places cycling at the heart of the streetscape or a new public space.

Whilst traditionally cycle parking in the borough has been introduced on the footway wherever possible cycle parking should be introduced in the carriageway in the same places that car parking is provided. This means that banks of cycle parking can be provided to people who cycle and parked cycles don't get in the way of pedestrians.

However well positioned cycle parking on the footway is vital if people are to be able to visit



Fin cycle stand



Cycle parking in the carriageway keeping the footway clear for pedestrians

shops etc. Where space is limited the stands can be installed diagonally or parallel to the kerb where footway widths are limited.

Always remember to consider whether cycles can be locked to the stands on both sides and without overhanging the kerb or blocking footways. An average cycle is about 1.8m long and 750mm wide. Specialist cycles such as cargo bikes can be up to 2.5m long wide. Always consider these dimensions rather than the dimensions of an empty stand when citing cycle parking stands.

## Residential cycle parking hangars

The council has begun a pilot project to introduce cycle parking hangars in residential roads.

The response from residents has been overwhelming and at the time of writing the network is being expanded to 30 hangars. The programme is to be expanded through the villages and town centres.

The hangars are normally introduced in existing car parking bays and open onto the footway. They can

be protected and the street environment enhanced by the introduction of protective islands with tree pits or planting either side. They can also be introduced on build-outs or public spaces but natural surveillance should always be a primary feature of site selection.

### The parking and loading mix

Demand for kerbside space and specifically parking and loading are often in excess of the space available, particularly when there is also demand from other uses such as bus stops or pedestrian crossing points. The introduction of on-street parking should be carefully considered and should only be proposed where there is a specific need. Capacity of a 12m wide road will be reduced by a third if parking is introduced on both sides.

The proposed parking mix for any section of a route should be developed with the needs of local traders, but more importantly local shoppers' needs should be carefully considered and incorporated wherever possible. Parking on the corridor should be limited to short stays to ensure turnover with longer stay parking (for hairdressers, doctors etc.) located on side roads.

The requirement for parking is often misunderstood, particularly by businesses who can overestimate the number of their customers who travel by car by 400%. A combination of engagement with shoppers and traders should be combined with data from parking surveys to ensure the right provision is provided in the right place.

Where parking and loading is provided the following mix should be adopted:

- A ratio of 2:1 for cycle and vehicular parking (for every car space one cycle stand)
- Parking on main corridor primarily for short stay shoppers (cyclists or car drivers) with longer stay bays (hairdressers, doctors) accommodated on side roads
- Loading provision every 100m (where feasible and required)
- Tree planting or greening on all parking and servicing islands
- Space for securely locking specialist bikes, for example cargo bike parking



Bikehangar in use, Waltham Forest

### Car parking

Car parking needs to be managed in such a way that it provides spaces for those who need them in locations that are advantageous but this needs to be done with the needs of all road users taken into account. Parked vehicles cause issues for people cycling and walking visually by blocking sight lines and physical obstacles that must be navigated around.

It is also important to remember that parking areas, particularly those dedicated to residential car parking are among the least functional uses of road space. Once introduced it will only ever be used for parking cars. In an average residential road in the region of half the available road space is given over to car parking meaning less space for all road users including other car drivers.

Where car parking is in situ it should be reviewed to ensure it does not cause pinch points for people cycling. This often happens when individual or small rows of parking bays are introduced and people on cycles have to compete with motor vehicle drivers to navigate round vehicles.

Parking bays should be terminated at 10 or 12m from junctions and should not be in situ near junctions on major roads. On quieter residential roads it may be feasible to reduce this to 5m but this should never be done at the expense of the safety of vulnerable road users or where it will affect desire lines for people walking or cycling.



Contraflow cycle lane protected by parked cars and door zone, Hanover Street, LB Westminster

One way to reduce pinch points associated with parked cars at these locations is to introduce build-outs of 2m width to effectively inset the existing parking bays. However the ability of refuse and emergency vehicles to still be able to access the road should always be taken into account.

On main cycle routes car parking should be relocated on the outside of cycle lanes or tracks wherever feasible, either in parking and loading islands or as floating parking bays. This can provide safer continuous segregated space for cyclists while still providing car parking. It should be remembered that a door zone should be marked (preferably 1m wide) to minimise the risk of 'dooring' and to provide a safe space for people to get in and out of cars.

'Dooring' which means people on cycles being hit by people opening parked car doors is a significant cause of injury to people cycling. Due to the fact car parking is often on the inside of cycle lanes this can also lead to secondary collisions where cyclists are knocked into moving traffic to their right.

Where space permits car parking can also be used to separate contraflow cycling facilities from general traffic as shown in the photo below. When available road widths does not permit moving parked cars outside space for cycling there are other solutions available. Cycle lanes can be marked on the outside of parked cars in the traditional fashion but with the addition of a door zone buffer to reduce the risk people exiting cars striking people cycling.

Alternatively car parking can be inset into footway areas as shown in the photos below. Wherever this is being considered designers should take into account the residual footway widths and minimise the risk of dooring by providing a door zone or parking bays that are sufficiently wide that this will not be an issue. It should also be questioned whether this is the best use of the public highway that could be provided instead to other public uses.

## Loading

Meeting demand for loading will be a key part of the Mini-Holland Design process to ensure that all road users can move freely around the borough. Loading vehicles on High Streets and other busy roads are pinch points for cyclists. Vehicles normally load on single or double yellow line restrictions that have periods of the day when loading is permitted or in designated loading bays.

When loading on yellow line restrictions vehicles are effectively breaking any cycle provision such as an advisory cycle lane. This means that anyone cycling has to negotiate around the vehicle by entering general traffic. This is of course an innegotiable barrier to some people who want to cycle and may deter them from doing so.

It should also be remembered that loading is defined as the loading or unloading of goods. Loading space is not customer or business parking and one of the most important parts of the parking and loading design process is understanding the requirements of any business.



Inset car parking with door zone, Queen Elizabeth Olympic Park

# Community involvement

This section is specifically about ways in which the community can be engaged in the development and upkeep of the Mini-Holland schemes as they are implemented. For details on the engagement approach and opportunities such as cycle training please visit the [enjoywalthamforest.co.uk](http://enjoywalthamforest.co.uk) website.

## Parklets

Parklets are a new alternative to car parking that has become a phenomenon in the United States particularly. They are small public spaces created in place of car parking. In some places parklets are introduced seasonally and removed during winter.

They come in various designs but have common characteristics in that they are designed to the dimensions of a car parking space, have places for people to sit and normally include some cycle parking. They are often introduced in the US by way of a local sponsor such as a café or bar or created with local resident or community groups as an additional place for people to relax and socialise. They also add greenery through planters or green walls. The introduction of parklets has been proven to increase footfall and retail activity.

## Walthamstow Village Parklet

During the Walthamstow Village pilot in summer 2014 Waltham Forest introduced Parklets on a temporary basis in Orford Road. They were constructed using recycled materials from the Highways Department's yard plus the addition of some AstroTurf. It appears they would be popular additions to the street in Waltham Forest particularly in the summertime.

## Introducing parklets

The introduction of parklets should be considered on a site by site basis and key to their success are:

- A location protected from general traffic and set back from any junctions



- A community or business partner to ensure parklets are kept clean and well maintained
- Should be constructed to the same width as the parking bay they are to be implemented in (normally 2.0m)
- Local drainage should not be interrupted and step free access from the adjoining kerb should be provided
- Cycle parking and places for prams and wheelchairs should be considered as part of designs

More information on parklets, their design and application can be found in guidance from the U.S. at: <http://nacto.org/usdg/interim-design-strategies/parklets/>

## Greening and planting

As part of the village and town centre schemes there is an aspiration to increase greening and tree planting throughout the area, primarily to make travelling around the borough especially on foot or cycle more enjoyable. Planting can be incorporated into many of the traffic management schemes being proposed but can also be used to improve unloved spaces and make them places people want to spend time.

Responses to the perception surveys conducted in the village areas suggest greening and tree planting are also priorities of local people who want to work with the council on the development of proposals.

It is important to remember that all proposals for greening require on-going maintenance. Whilst the funding for the Mini-Holland Programme is significant it does not include funding for the long term maintenance of planting. It is therefore vital that where greening is to be implemented species selection includes consideration of maintenance. More importantly agreements with local resident and community groups who are interested in utilising new green spaces should be sought to reduce any maintenance burden on the Council.

## Tree planting

Tree planting should also be a central theme to the work in residential areas as part of the Mini-

Holland Programme. Trees are essential parts of the streetscape and are a vital tool in combating issue with air quality. They also improve the street scene by softening the landscape and add vital colour and contrast from buildings. Despite being relatively green borough tree canopy coverage in most Mini-Holland areas is either low or very low.

Wherever feasible gaps in tree canopy coverage should be identified and additional trees planted as part of the overall works. A tree strategy for the borough was produced in 2012 and should be referred to for guidance on planting and species selection.

Tree planting is another opportunity to get the local community particularly schools involved in the project.

More information on tree canopy coverage in the borough can be found at:

<https://www.london.gov.uk/priorities/environment/greening-london/re-leaf/mayors-street-tree-initiative/street-tree-map>

## Pocket parks

Pocket parks is the name given to small areas of contained planting or small areas of green space in the urban environment. There are no real rules as to what can constitute a pocket park.

They normally provide an opportunity for local people to enjoy a space that more often than not was used for another purpose or transform an unloved space.

The photo to the left shows a pocket park introduced at a wide junction in Clapham, Lambeth. Previously



the tarmacked area was used as a place for a bin and a grit store. The introduction of planters (maintained by local residents) and seating has transformed the redundant space into a place that neighbours now socialise and grow vegetables.

## Rain gardens

Rain gardens are sustainable drainage features. They are designed to intercept rainfall and use the water to sustain planting. No matter how small the gardens they can have a major impact on surface run off which can contribute to flooding particularly in urban areas. Rain gardens require run off from the carriageway and at grade planting areas or breaks in kerbs to enable water to drain into them. Alternatively they can be supported by footway run off being directed into them.

In order to support the greening of the Mini Holland areas the use of rain gardens should be considered throughout the village and town centre areas. Where necessary protection from people parking cars should be introduced as part of the design.

It should be noted that the introduction of rain gardens are supported and encouraged in the Waltham Forest Flood Management Strategy.

## Schools

Schools in the borough are a key partner in the development of proposals for the Mini-Holland Programme and parents and children are some of

our most important stakeholders. There are a number of issues associated with how children travel to school which can be addressed by the introduction of measures which form the basis of the Mini-Holland Programme.

School children being driven to school is one of the main causes of traffic congestion in peak times and this in turn contributes to road safety and air quality issues. Often the distances that children are driven are easily walkable or cyclable and are in fact often quicker.

It is hoped that the introduction of safer walking and cycling routes throughout the Mini-Holland area, coupled with changes to the local road network to prevent rat-running will encourage parents to consider walking and cycling to school with their children.

There are however changes that can also be made to the local environment around schools that can improve the situation further.

Narrowing of road outside a school in Lambeth to provide space for children and prevent parents parking in school keep clear area

At a number of schools in Lambeth issues were occurring with parents disregarding school keep clear markings and even parking on pavements to drop off their children. The photos above show how this was addressed at one school by the building out of the footway to make it impossible to stop in front of the school without impeding traffic flow.



Narrowing of road outside a school in Lambeth to provide space for children and prevent parents parking in school keep clear area



This was supplemented with planters for children to grow vegetables, seating and crayon shaped bins. The walk to school has also been made more fun with snakes and ladders and hop scotch marked on the footway. The relatively low cost intervention is now 'owned' by the children of the school who are using their planting areas and meet friend before and after school in their new space.

In Waltham Forest the Council has worked with Noor UI Islam School to introduce cycle parking in front of the school. Two car bike ports which show how many cycles can fit in a car space have been introduced in front of the school. Children from the school have produced their own sustainable transport posters which have been added to the bike ports.

In Edinburgh the local authority has been even more proactive in addressing the issue of people driving their children to school by introducing car exclusion zones in the immediate vicinity of a number of primary schools. The aim is to remove any



competitive advantage driving children to school may provide by ensuring parents and children have to walk the last part of the journey.

### Public Art

Public art can be a great way to instil a sense of place and make a walking or cycling route more interesting and fun. There are also opportunities to involve members of the community in the development of pieces of street art including the vibrant artist community of the borough. The E17 art trail is ever expanding and ever popular and provides an opportunity to encourage people to walk and cycle for leisure.

Opportunities to introduce public art should be identified with the local community, particularly at locations such as gateways or new public spaces. Art can also be embedded into the streetscape. An example is 'the birds' on Leytonstone High Road, near the location where Alfred Hitchcock was born.

## Play streets

Play streets are events when streets are closed to traffic so local children can use the road space for informal play. Streets are normally closed for 3 hours at a regular time every week. They are great ways in which the street can come together and children can meet their neighbours and build friendships. Waltham Forest already runs a successful play street programme which includes 20 streets.

Play streets are enabled by the Council through the provision of traffic orders and traffic management equipment such as cones and signage. It is however local residents who effectively run play streets including any marshalling at entrances or junctions. Not all streets can be play streets as some serve as main accesses to residential areas but the concept should be applicable to most. Further information and supporting information can be found at: [http://www.londonplay.org.uk/content/30290/our\\_work/recent\\_work/play\\_streets/play\\_streets](http://www.londonplay.org.uk/content/30290/our_work/recent_work/play_streets/play_streets)

## Car clubs

Car clubs are pay as you go alternatives to private car ownership. Cars and vans are located in parking bays in streets near to where people live and work. People can sign up (normally with an annual fee and then pay for vehicles when they need them. Car clubs provide a range of benefits to the user, other local people and the wider community by:

- Reducing car parking pressure- the average car club car replaces and removes up to 25 locally owned cars meaning more kerbside space to put to alternative uses
- Car clubs members drive less reducing congestion
- Car club members walk, cycle and use public transport more than private car users
- Car clubs provide a range of vehicle options when people need them

There are currently two car club operators in the borough namely Zip car and Drive Now. Zipcar offer the traditional car club A-A model with cars that are returned to the same parking bay after use. DriveNow offer a floating car club system where members find cars using a smartphone app and use

the vehicles one-way leaving them in an appropriate parking space at their destination.

As part of the Mini Holland Programme there is the opportunity to expand the car club network in the borough significantly. In most engagement and consultation documentation we are asking respondents if they are interested in the introduction of more car club vehicles.

Where a positive response is received officers should liaise with transport planning and Zipcar to assess the potential for additional vehicles. If agreement is reached on a new location then a local consultation should be carried out. This can of course be embedded in wider area or route proposals to provide cost savings on engagement.

If local support is received then following the statutory consultation process a car club bay (TSRGD 1028.4) should be introduced for the new location. Similarly to the consultation process this can be done much more cost effectively if batched with other local changes waiting and loading restrictions.

# Route making and mapping

In many instances of best practice cycle routes are fun and interesting. From the saddle the world is an entirely different place. We want our cycling corridors to be easy to use and also places that all people enjoy. In addition to signage we want cyclists to be able to identify what route they are on easily and ultimately for the routes to have their own identity.

The borough will be working with the local community to develop an identity for each route but it is likely that inspiration will be taken from the local landscape (the Lee Valley, Epping Forest).

We propose the use of local artists to add extra creative input into the route making process. This will include the potential provision of public art at key strategic locations along the routes.

A wayfinding strategy for the Mini-Holland Programme is being developed for use across the entire network. This section will be developed following the completion of the strategy.

Simple additional measures and features can also be introduced that improve the experience of cycling.

## Access for buses

Whilst modal filtering and traffic management measures to limit the ways in which general traffic can access residential areas is a key constituent of the Mini-Holland proposals access for buses should be maintained. Buses are a vital part of the public transport offer in Waltham Forest and are well used for both journeys inside and out of the borough. Many people use buses as part of combined mobility journeys including commuters.

It is hoped that more and more people will choose a combination of walking, cycling and public transport in place of private car journeys in the borough. The Mini-Holland Programme should therefore look to improve access for buses as part of the overall final proposals.



West Avenue Bridge, Walthamstow Village



Cyclist counter



Foot rest for cyclist



Some modifications may be made to bus services during the programme but these will be aimed at improving bus journey times. Any proposals that will impact on bus access should be developed in partnership with Transport for London and the respective bus operators.

In the Walthamstow Village pilot area the W12 bus service will be one of the only permitted vehicles allowed to travel directly through the Walthamstow Village area once the final proposals are implemented. The reduced traffic levels in the surrounding area should mean that the service has increased reliability and fewer delays for passengers.

### De-clutter

The Mini Holland Programme provides a great opportunity to de-clutter the street environment. The borough has relatively clutter free streets but there are always opportunities to remove sign posts by combining signs on posts or removing redundant posts and signs. Some locations suffer from numerous attempts to deter anti-social behaviour. As seen in the picture at Beulah Path signs are in place on 3 posts to give messages about parking controls, fly tipping, and neighbourhood watch and to ban cycling.

Bollards have also historically been used quite extensively in the borough to deter parking or protect

infrastructure. Whilst introduced to address a valid issue bollards are maintenance issues, reduce footway and cycle track widths and are often unsightly.

Wherever possible bollards should be replaced with greener alternatives such as planters or trees. Cycle stands can even be used in place of bollards but must not be introduced where it is likely parked cycles will be struck by vehicles.

Designers must also be mindful of the number of new signs and items of street furniture being introduced as part of the programme. The photo left shows the signage and street furniture in a stretch of road about 100m long in the Queen Elizabeth Olympic Park.



# Appendices



# Ideas and inspiration

## William Morris

### William Morris and Walthamstow

William Morris was born in 1834 into a wealthy family at what was then Elm House on Forest Road, opposite where Walthamstow fire station is today.

From 1848 to 1856 he lived at Water House, now the William Morris Gallery. Morris lived here with his mother and eight brothers and sisters from the age of 14 until 22, writing some of his earliest poetry seated in the tall window on the main staircase.

The young Morris used the moat in what is now Lloyd Park for boating and fishing in summer and ice-skating in winter. Pre-Raphaelite artist Edward Burne-Jones painted studies of the island when he visited the Morris family in the 1850s.

### Morris's environmentalism

Morris was an important forerunner of modern environmentalism – a legacy recognised by the Environment Agency, who named him one of the most influential environmental campaigners of all time.

For Morris, art and nature were inseparable. His designs were inspired by the patterns and rhythms of nature and he decried the damaging effects of industrialisation and pollution on the natural environment. He was also actively involved in the campaign to prevent the enclosure of Epping Forest, which he knew “yard by yard”.

Morris envisaged a society in which people lived and worked together in a healthy, aesthetically pleasing environment, free from pollution and overcrowding. His ideas were a major influence on Ebenezer Howard, founder of the garden city movement.



*“Is money to be gathered? Cut down the pleasant trees among the houses, pull down ancient and venerable buildings for the money that a few square yards of London dirt will fetch; blacken rivers, hide the sun and poison the air with smoke and worse, and it’s nobody’s business to see to it or mend it: that is all that modern commerce, the counting-house forgetful of the workshop, will do for us herein.”*

*“That art will make our streets as beautiful as the woods, as elevating as the mountain-sides: it will be a pleasure and a rest, and not a weight upon the spirits to come from the open country into a town; every man’s house will be fair and decent, soothing to his mind and helpful to his work: all the*

<http://www.theguardian.com/environment/2006/nov/28/climatechange.climatechangeenvironment>

*works of man that we live amongst and handle will be in harmony with nature, will be reasonable and beautiful: yet all will be simple and inspiriting, not childish nor enervating; for as nothing of beauty and splendour that man's mind and hand may compass shall be wanting from our public buildings, so in no private dwelling will there be any signs of waste, pomp, or insolence, and every man will have his share of the BEST."*

## Lesser Arts, 1877

*"Pray do not forget, that anyone who cuts down a tree wantonly or carelessly, especially in a great town or its suburbs, need make no pretence of caring about art."*

## Hopes and Fears for Art, 1880



## Morris's initials



Morris designed several of his own typefaces inspired by the work of early printers.

## “Golden” typeface

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
ZÀÅÉÎÏÕØabcdefghijklmnopghijk  
lmnopqrstuvwxyzàåéîõø  
&1234567890(\$£€.,!?)

### “Troy” typeface

A B C D E F G H I J K L M  
 N O P Q R S T U V W X Y  
 Z À Á Ê Ë Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã ä å æ ç è é ê ë ì í î ï ð ñ ò ó ô õ ö × ø ù ú û ü ý þ ß  
 1 2 3 4 5 6 7 8 9 0 ( \$ £ € . , ! ? )

### The River Lea

The River Lea flows through the Lee Valley on the western boundary of the borough. The route of the river is bordered by Hackney Marsh, Leyton Marsh and Walthamstow Marsh as well as a number of reservoirs which are to be transformed into Walthamstow Wetlands.

### John Kemp Starley

The inventor of the ‘safety’ or modern bicycle was born and lived his early life in Church Hill, Walthamstow. There is nothing to commemorate this and opportunities to raise the profile of this great innovator from the borough should be taken.



### More information

More information about William Morris can be found at the award winning William Morris Gallery on Forest Road. More information about the boroughs heritage and former residents can be found at the Vestry House Museum or on the Council website

[www.walthamforest.gov.uk](http://www.walthamforest.gov.uk)

# WALK CYCLE ENJOY