

DfT Strategic Studies Budget Dover

Design Principals for the Integration of Dover BRT into Whitfield Master Plan

July 2010

DfT Strategic Studies Budget - Dover

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23rd July 2010

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1. Introduction

Atkins Transport Planning and Management (Atkins) has been commissioned by the Department for Transport (DfT) Housing Growth Team to undertake a study to provide transport planning support to selected local planning authorities who are seeking to deliver significant quantities of new housing in areas within their jurisdiction.

Each of the areas has been granted growth point status and face numerous and varied challenges to deliver development which is as sustainable as possible. Dover District Council (DDC) was successfully selected to receive funding and assistance, and a project inception meeting was held in December 2009, which was also attended by representatives from Kent County Council. At the inception meeting DDC specifically requested assistance from Atkins with regard to delivery and integration of a Bus Rapid Transit service.

Five tasks were highlighted through discussion with DDC and Kent County Council. These were to consider:

- The corridor and form of the BRT connection across open land between White Cliffs Business Park and Dover Road;
- The most appropriate location for a Park and Ride site at Whitfield, also to be served by the BRT;
- A strategy for incorporating and delivering the BRT service within the proposed residential development at Whitfield;
- The potential location for a new bus hub on York Street to serve the BRT, but also to consider relocation of the existing interchange on Pencester Road; and
- A strategic assessment of the route corridor for a Park and Ride service (and potentially BRT) from a potential site at Farthingloe.

This report provides a review of the work Atkins has undertaken for the third task considering the integration of the BRT within Whitfield. The structure of this report is as follows:

- Section 2 – Overall aim of the document;
- Section 3 – Background to Dover BRT and proposed development at Whitfield;
- Section 4 – Key objectives for the BRT;
- Section 5 – Key design principles for the BRT in Whitfield; and
- Section 6 – provides more detailed explanation and guidance on how to design the Dover BRT into the Whitfield masterplan.

As yet there is no clear masterplan for Whitfield; therefore it is very difficult to provide considerable detail on how to fully integrate the service as the routes it could follow are unknown. The key to the success of the BRT will be achieving the correct balance between accessibility and speed. Clearly the service needs to be easily accessible to as many residents of Whitfield as possible from both the existing settlement and the new development areas, but increasing accessibility would result in longer routes and more stops, which would increase journey times, thus reducing the rapidity of the service.

2. Project Aim

The overall aim of this task is to produce a guidance document to assist Dover District Council and Kent County Council in responding to the emerging Whitfield masterplan with specific regard to the successful integration of the Dover BRT.

The Dover BRT scheme is at the heart of the development and regeneration plans for Dover and is a key transportation project which should contribute greatly to the successful delivery of major development such as Whitfield. The successful integration of the BRT into the urban and social fabric of Whitfield will enhance the ability of the system to deliver a real transport choice and a vital alternative to the private car, which is necessary to provide a solid financial basis for the system.

This document provides advice and guidance in relation to the design features and principles that can be utilised by the two councils, developers, urban designers, architects and transportation professionals to shape the Whitfield masterplan. Considering the BRT at the masterplan design stage should allow for better integration and a service which can operate most effectively. Not taking the BRT into account during the masterplan design can lead to retro-fitting of infrastructure at a later date which may compromise the success of the service.

3. Background

3.1 Literature Review

3.1.1 Bus Rapid Transit

The concept of an express bus service for Dover has been proposed in many planning policy documents for the town. The Dover Transport Strategy (WSP, March 2008) listed a Park and Ride at Whitfield, and an express bus service amongst other schemes as key elements of the future transport strategy. Included in this list of key elements was improved public transport access to Dover Priory Station which can be achieved with the BRT service. The Transport Strategy mentions that with the existing bus services and routes for many cross town public transport trips passengers are required to change buses at Pencester Road.

Journey to work data suggests that around 67 percent of journeys are internal to the town with the key attractors being the docks, especially from Whitfield (Transport Strategy, 2008). Three of the objectives of the Transport Strategy are as follows:

- To facilitate the delivery of LDF sites including development of an integrated urban expansion at Whitfield;
- To maximise the attractiveness of travel by public transport; and
- To deliver infrastructure necessary to support development.

The LDF Core Strategy (February 2009) highlights the private car as the dominant means of transport and that walking, cycling and public transport need to be made more viable and effective means of transport. This is noted as including a fast bus service between the new urban areas at Whitfield and the town centre. The steep topography between Whitfield and the town centre, as well as the distance, means that walking and cycling journeys from Whitfield are likely to be limited, leaving bus travel as the main alternative to private car use.

Bus Rapid Transit is not a new idea, but has been employed in many towns and cities across the world. The extent of the BRT networks in some cities can be extensive, catering for hundreds of thousands of passengers. With a huge variety of different designs, from on-street bus lanes to segregated bus-ways, to bus tunnels and underpasses, all utilise priority measures to allow buses to pass without delay through urban areas. Where successful, BRT can realise significant time savings for passengers and is generally cheaper to implement than rail based systems, as long as complex infrastructure is not required.

3.1.2 Whitfield

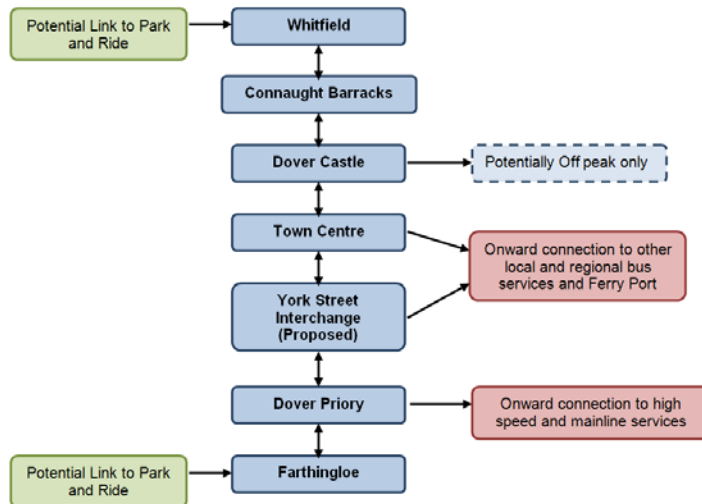
Within the LDF Core Strategy (adopted February 2010) the forecast housing growth is focussed on Dover, with a target of 14,000 new homes.

Within Dover itself, four strategic sites have been allocated within the Core Strategy. The principal residential site is the land surrounding Whitfield where 5,750 homes are proposed on an area totalling 309 hectares. The current access arrangements, especially the A2 Whitfield Roundabout which currently has capacity issues, are noted as being unsuitable to accommodate such significant development. The development, therefore, must include measures to maximise walking and cycling, and the use of public transport, with better bus links to be provided to the town. Maximising connections to the town centre is vital to encourage residents to use Dover for employment, shopping and leisure rather than competing centres such as Canterbury.

3.2 Dover Bus Rapid Transit

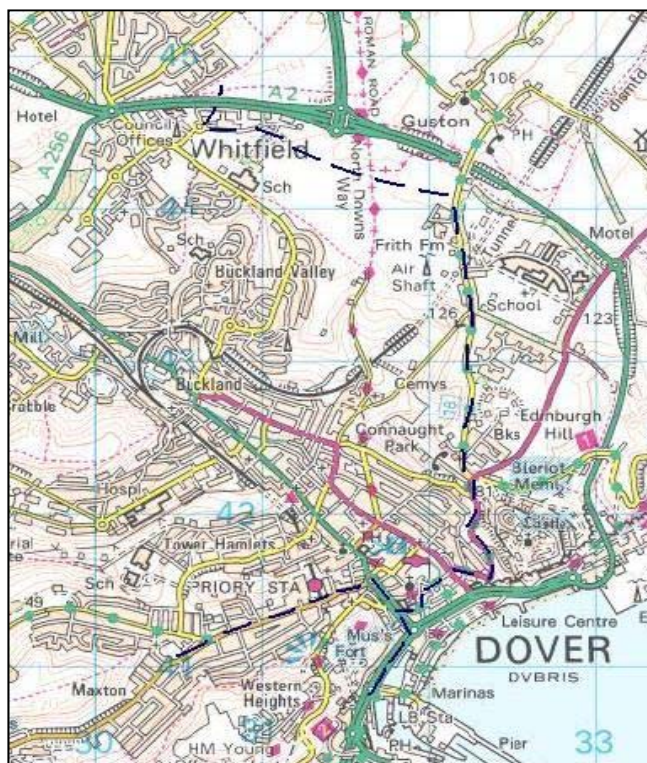
The proposed Dover Bus Rapid Transit (BRT) is intended to be a bus-based public transport system that will connect the settlement at Whitfield with key destinations in Dover, anticipated at this stage to be as shown in Figure 3.1.

Figure 3.1 – Key destinations and onward connections



The system is planned to be a high quality express service similar to the existing FastTrack in North Kent and the Thames Gateway, and the Cambridgeshire Guided Bus (CGB). However, unlike FastTrack or the CGB, the Dover BRT will run on a mix of dedicated infrastructure and the existing streets and roads of Dover itself, which will require installation of bus priority measures to ensure minimal delays. The proposed route is shown on Figure 3.2.

Figure 3.2 – Dover BRT: indicative route



The Dover BRT will have a high frequency of approximately 7 / 8 minutes during the day and 15 minutes during the evening and will operate between 0600 and 2400. It will operate seven days a week.

3.3 Proposed Whitfield Development

It is understood from attendance at design workshops that there is no formal masterplan agreed for the Whitfield area (as at April 2010), but that it is intended for the development to raise the housing market offer within the town. It is therefore expected that the majority of the units would be family housing with 3 / 4 bedrooms with a lower density than originally considered by the Core Strategy.

The aspiration is to attract residents who are attracted to the town for the surrounding countryside and coast, the newly regenerated town centre with high quality retail and leisure facilities, and the fast public transport links to London via the High Speed 1 service to St Pancras International.

The high speed, high quality BRT service is essential to realise this aspiration, and to maximise the benefit of the high speed rail services and connection to the town. The BRT must operate in such a manner that makes it more attractive than private car use.

4. Objectives

Because there is no defined masterplan it is possible to allow the design and operational objectives for the BRT to inform the masterplan, rather than the master plan constraining the deliverability and functionality of the BRT. This is with specific regard to route and corridor form in particular.

4.1 Key Objectives

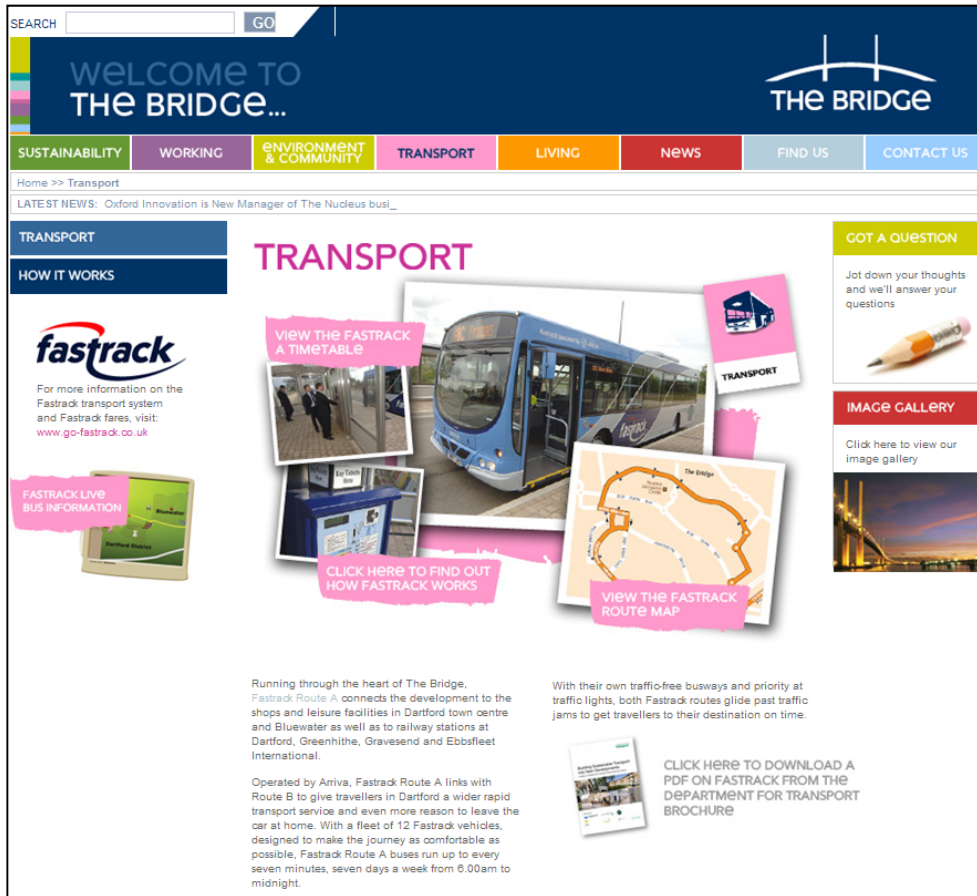
The aim of the BRT is to provide a fast and frequent bus connection from Whitfield to key locations within Dover. To realise this aim the key design objectives for the BRT are considered to be as follows:

The BRT should be a fundamental feature / characteristic of the Whitfield development

The Dover BRT should be promoted as a key feature of the proposed Whitfield development, both from a transportation and urban design perspective. The BRT and its supporting connections should be fundamental to informing the masterplan and the design of the new settlement. At later stages, during marketing and sales of properties, the BRT should be advertised as a key selling point for the development.

FastTrack, which serves north Kent and is actively marketed within new developments along the route. The Bridge, Dartford is a major mixed use development comprising office space, industrial space, 1,500 new homes and education, healthcare and leisure facilities. FastTrack is a key part of the development's attraction, providing fast and reliable journeys to the business / industrial land uses for commuting, but also for allowing residents of The Bridge to access facilities in Dartford and beyond. Figure 4.1 is the transport page from The Bridge website, which shows how important FastTrack is to the development and how it is used as a marketing tool.

Figure 4.1 – The Bridge website transport pages



The BRT must be fast, should have maximum priority, directness and reliability as it travels through the development and at stops

Building on the previous point, the masterplan should be shaped to provide the BRT with priority, directness and reliability as it travels through the development. The BRT must be as fast as possible to be a realistic alternative to car travel. Stops should be located within key areas of the masterplan, for example the local centre or employment areas and also where key walking and cycling routes intersect the BRT route.

Many existing BRT services are branded, with the identity closely linked to the speediness of the service, for example FastTrack in North Kent or the Edinburgh Fastlink.

Successful integration of the BRT should not be achieved at the cost of creating and maintaining a sense of place

Achieving maximum priority for buses and transportation infrastructure can sometimes create barriers to movement or be intrusive into the street scene and can be counteractive to other objectives such as place making and walkable communities. The BRT in Whitfield should avoid doing this through:

- Avoiding the need for large infrastructure that results in physical severance or creates an unnecessary barrier to movement;
- Not detracting from a walkable and cycleable settlement; and,
- Minimising the intrusion into the street scene along its route.

Figure 4.2 shows a central London street with bus lanes in each direction. This not only creates a wide corridor for pedestrians to cross, but the red surfacing is also visually intrusive.

Figure 4.2 – London Transport corridor with bus lanes



As far as is possible the BRT should be integrated into the existing settlement, as well as the new development

The proposed new residential areas surround Whitfield to the north, east and west. A BRT route which only serves these new areas, following an alignment which essentially bypasses the current settlement, should be avoided. The BRT can bring benefit to the existing residents which may help to offset the negativity towards the urban expansion. To successfully achieve an integrated route without greatly increasing the journey time is a key design challenge.

5. Key Design Principles

In order to achieve the overall aim and the objectives that have been set out above it is considered that the following characteristics and principles should be incorporated into the masterplan and more detailed neighbourhood design:

- The development as a whole, but particularly at neighbourhood level, should be a walkable design with the pedestrian at the top of the road user hierarchy. People need to feel able to access the BRT on foot;
- BRT stops are to be a prominent focal feature in the street, both in location and design incorporating real time bus information;
- BRT stops are to be located at the key social and neighbourhood nodes such as local centres or employment areas;
- BRT stops are to be located at the confluence of several key cycling and pedestrian collector routes that feed into the BRT route;
- The development surrounding a BRT stop should be the highest density to maximise the accessibility to a larger number of prospective passengers and the natural surveillance of the stop;

- The number of BRT stops should be kept to a minimum to retain the “express” characteristic of the service;
- A minimum of 90% of the development should be within 600 to 800m of a stop. However, this will need to be balanced against the need to minimise the number of stops to retain the “express” characteristic of the BRT service;
- Parking and loading, particularly publicly accessible parking and on street parking, should be restricted or closely managed within a 10 minute walking distance around a BRT stop;
- Information on the BRT should be available throughout the development, public places and in the home; and,
- The route of the BRT needs to be direct and have priority over the private car, but does not necessarily need to be visible along its entire journey. This will maintain the “express” element without destroying the senses of place.

The main features of BRT system are as follows, some of which are more relevant than others to the Whitfield scheme:

- Dedicated carriageway whether segregated from main carriageway or as a bus lane if not detrimental to walking, cycling and place shaping;
- Attractive stations / stops;
- Distinctive and easy to board vehicles, with low floors and cleaner technology;
- Off-vehicle fare collection;
- Use of ITS technology;
- Frequent, reliable all day service.

Simplicity, frequency, image and identity are essential for a successful BRT system. A well designed BRT system which is efficient and given priority over other vehicles can realise passenger time savings of 2-3 minutes per mile.

6. Design Principles in Detail

The design of streets must place a priority on the needs of pedestrians, cyclists and public transport users above the needs of cars. Streets should be designed to provide high quality public places, not just routes for vehicles. Streets which work as high quality places provide positive outcomes, including:

- Well connected and permeable streets which encourage people to walk or cycle, therefore reducing car use, improving health, reducing energy use and pollution;
- Increasing walking and cycling results in more people being on the streets which improves personal security and road safety;
- Strengthened communities as people are more likely to meet neighbours whilst walking as opposed to driving; and
- Residents who live within high quality environments are more likely to take pride in their surroundings and maintain the quality of streets and public spaces.

Providing well designed streets, which are well connected and which can encourage people to walk or cycle is essential in the delivery of sustainable communities. Streets need to be well designed for pedestrians and cyclists as these are the modes which people will use to access the BRT from their homes.

Figure 6.1 shows a well designed high street where the carriageway has been reduced in width to provide wider footways, with traffic calming measures to control vehicle speeds. The high quality paving and street trees contribute to a high quality environment which is pleasant to walk in, and with seating areas the town centre becomes a focal point and meeting place, which the public are proud of and therefore look after.

Figure 6.1 – Chepstow High Street




6.1 Walkable Design

Walking and cycling are important transport modes offering a cheap and sustainable alternative to private car travel, which can contribute to improved health and environment. Walking and cycling between Whitfield and Dover is considered unlikely due to the distance and the topography, however walking, or cycling, to local centres and to BRT stops can be achieved if streets are well designed.

Streets should be given an active frontage with natural surveillance to improve the safety and security of people walking and cycling, and walkable neighbourhoods are shown to encourage social connection.

In considering the best layout for streets within the masterplan area, the designer should first consider the needs of pedestrians then follow a user hierarchy as shown in Figure 6.2. Generally speaking the neighbourhood design which uses blocks is effective at providing convenient, easily legible, well connected and overlooked pedestrian routes.

Figure 6.2 – Street user hierarchy

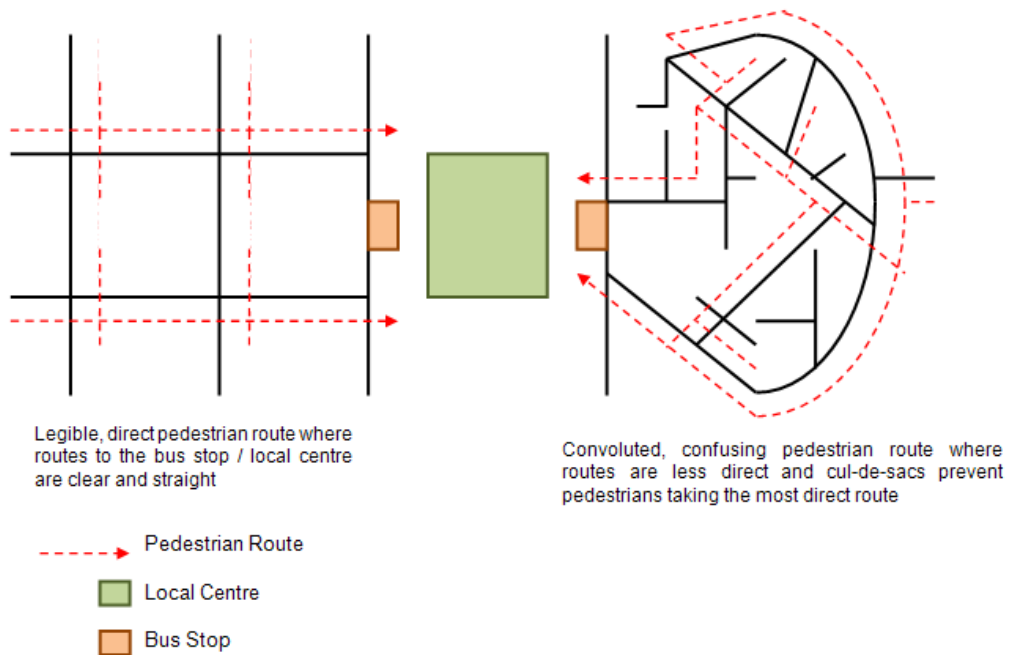
	User
Consider First  Consider Last	Pedestrians
	Cyclists
	Public Transport
	Specialist vehicles i.e. emergency services, waste collection
	Other motor traffic

Successful application of the user hierarchy will result in a development where walking, cycling and public transport use is far more attractive than car use. The physical design of the neighbourhoods must be complemented by the careful allocation, and co-location of land uses. BRT stops should be located with local shops and facilities, which should be available within 10 minutes easy walking distance of homes. This would maximise the potential for walking trips, but

would also to simplify the layout of a neighbourhood so people know where they can catch the BRT from. Pedestrian and cycle routes in Whitfield should fully integrate with the BRT.

Straight streets provide direct routes for pedestrians and can maximise connectivity and decrease walking times, but long straight streets increase vehicle speeds. Short, winding streets contribute to variety but are unpopular with cyclists and pedestrians as they create longer, less direct routes. A legible street pattern, avoiding cul-de-sacs creates a development in which it is easy to walk and easy for people to find their way around, this is illustrated by Figure 6.3.

Figure 6.3 – Direct and indirect walking routes



Provision for parking on street should be carefully considered as informal parking not only detracts from the appearance of the street, but parking too close to junctions, crossings and on footways reduces visibility for pedestrians and drivers, and obstructs movements along the footway. On-street parking also creates congestion for vehicles and can significantly delay bus services.

6.2 Connectivity

6.2.1 Legibility and Wayfinding

Pedestrian movement is highly influenced by street configuration. Street design can have a strong effect on whether people choose to walk, where they walk and how easy it is for them to navigate through a space. Research shows pedestrians are sensitive to the complexity of routes and tend to choose simple direct routes over more complicated indirect ones (Hillier, B., *Space is the Machine*, 1996, Cambridge University Press).

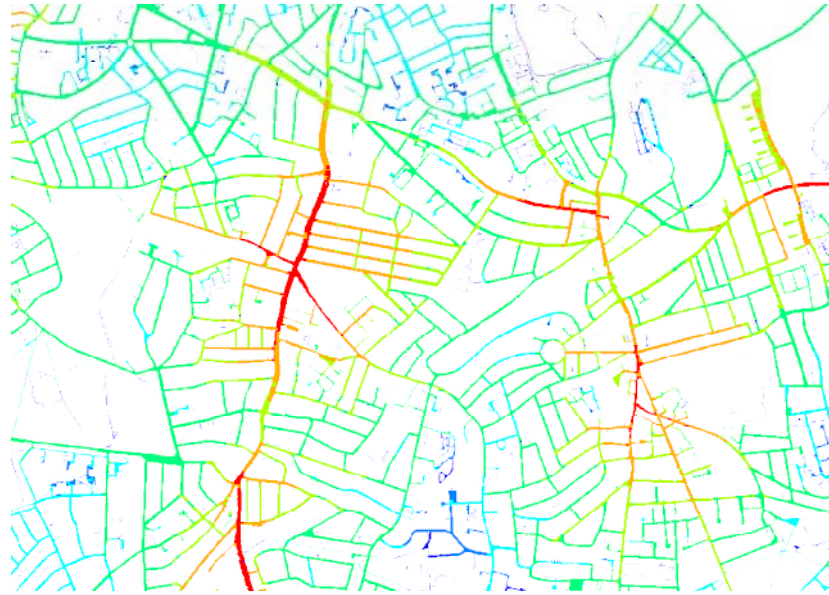
The development should support ease of navigation by creating a clear hierarchy of routes between neighbourhoods and within each neighbourhood.

Computer modelling can be used to analyse how well connected different streets are to each other and how well they are likely to function as channels for pedestrian flows. Visibility Graph Analysis can be used to assess the strengths, weaknesses, opportunities and threats provided by the masterplan at design development stage. This analysis can be layered with land use and transport accessibility to show their combined effect on movement routes. This can be used to show how well the BRT is integrated within the street network and to highlight important design

considerations, such as the location of pedestrian crossing facilities based on desire lines for crossing.

An example of an analysis of how well connected public transport nodes are with the wider street network is shown in Figure 6.4 below. The streets where it is easy to navigate to transport facilities (in this case underground or national rail) are shown in red and orange, through a spectral range to the least accessible in blue. This highlights locations which are physically close to a range of facilities but would find it hard to navigate to them.

Figure 6.4 - Map of public transport accessibility (South London)



In addition to a clear pedestrian network, routes should be supported by clear signage/wayfinding throughout the development. This should indicate location and distances to/from BRT stops and the main pedestrian attractions within the area. Consideration should be given to signposts using walking, or cycling times as well as distances.

6.2.2 Natural surveillance

The location of buildings entrances is an important factor determining the public's perception of safety as they move through the public realm. This is because building entrances offer the potential for someone to emerge into a public space and possibly intervene if a criminal act is being undertaken, which makes the perpetration of crime more difficult within visual field of the entrance. This natural surveillance or "eyes on the street" can help deter anti-social or criminal behaviour, such as vehicle theft, as well as making users feel safe (Jacobs, J., *The Death and Life of Great American Cities*, 1961).

The development should aim to maximise the natural surveillance from building entrances, particularly along the routes to the BRT stops. This will encourage use of the BRT stops by the local residents.

An example of natural surveillance analysis is shown in the figures below. Figure 6.5 shows the building entrances considered in the analysis, while Figure 6.6 shows the result of the analysis. Areas with more than 30 entrances in view are shown in red, through a spectral range to blue, where no building entrances are in view.

Figure 6.5 - Map of building entrances

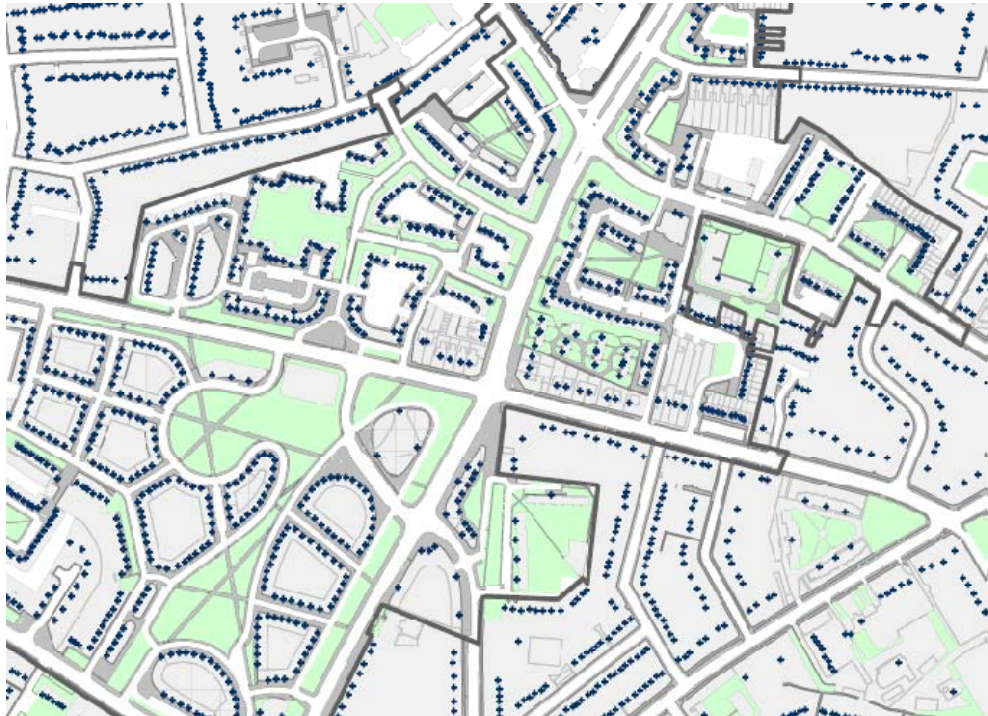


Figure 6.6 - Map of natural surveillance



6.2.3 Connectivity within Whitfield

Historically planners have tended to favour cul-de-sac designs for streets, which can greatly reduce the connectivity between neighbourhoods, as illustrated in Figure 6.3. Where pedestrian routes are provided between cul-de-sacs these can be alleyways or footpaths which are unattractive to use, as indicated in Figure 6.7. This cul-de-sac street pattern is well demonstrated

in the current layout of streets in the eastern areas of Whitfield, adjacent to where the new development needs to integrate.

Figure 6.7 – Unattractive pedestrian alley.

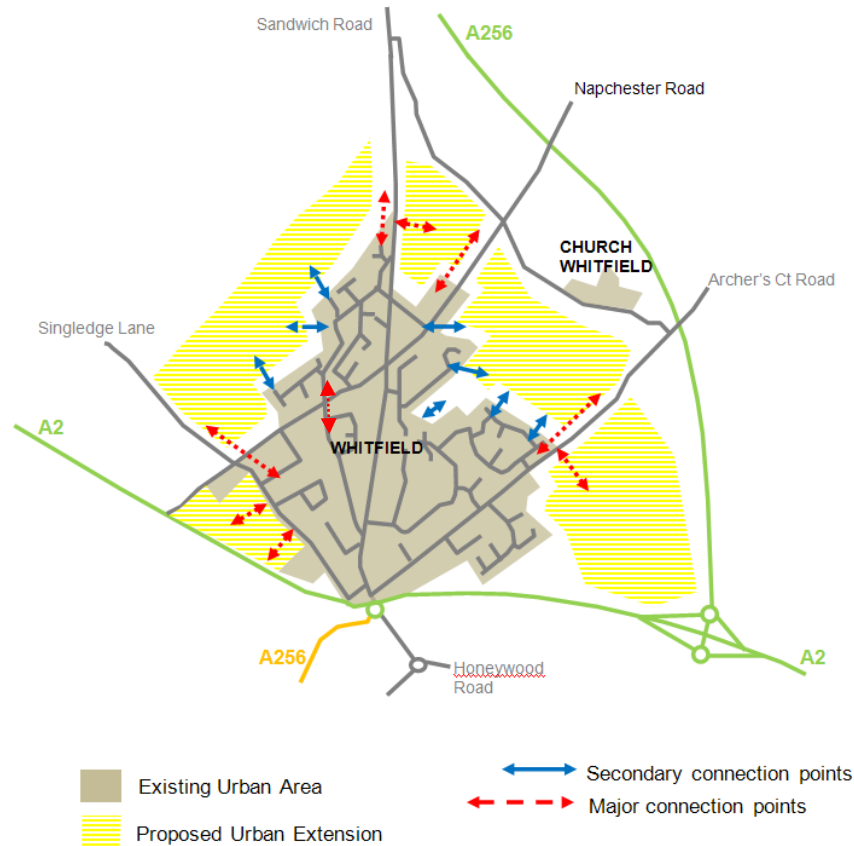


Successful street design needs to work as part of a fully connected neighbourhood. Connected or 'permeable' networks encourage walking and cycling, ease navigation and promote safety and security. Well connected streets also cause the dispersal of traffic reducing the need for distributor roads which cause severance for pedestrians.

With Whitfield the challenge will be to successfully connect the new development to the existing development. Failure to create successful connection will leave the new and old areas feeling segregated and disparate to each other. Creating successful connection and integration will allow existing residents to benefit from the new development and facilities it will bring, such as the BRT.

Primary connections should be provided via Singledge Lane, Bewsbury Cross Lane, Sandwich Road, Napchester Road and Archer's Court Road, as shown by Figure 6.8. These are established corridors for vehicular traffic but with the exception of Sandwich Road and Archer's Court Road all would require upgrading to provide pedestrian and cycle facilities. Napchester Road and Singledge Lane are both narrow carriageways with no current footway provision. For pedestrians, Singledge Lane is particularly poor as the connection to the remainder of the network is either via the A2 where there are no footways, or via a poor quality pedestrian connection through to the rear of the garages on the corner of the A2 and Sandwich Road.

Figure 6.8 – Major connection routes between existing settlement and new urban areas



Additional secondary connections for pedestrians and cyclists can be achieved in many locations using existing connections between Whitfield and the surrounding countryside. Based on a simple desk study, the following are considered potential secondary connections from south-west round to south-east:

- Lenacre Avenue;
- Forge Lane;
- The Pier;
- Napchester Road from opposite The Drove;
- Beauxfield;
- From the playing fields on Cranleigh Drive; and
- At several points along Farncombe Way.

These connections would need to be improved to be of the highest standard for pedestrians and cyclists.

6.2.4 Connectivity with Dover

At present the main connection from Whitfield to the wider road network is via Sandwich Road onto the A2 at the Whitfield Roundabout, as shown on Figure 6.9. The roundabout is known to have capacity problems and therefore unable to accommodate additional traffic from the proposed development, without improvement.

Figure 6.9 – Sandwich Road on the approach to the roundabout with the A2

There are alternative points where the road network for the new development could join the wider road network. A new connection could join the A2 to the west of Green Lane to serve the urban extension areas to the west of Whitfield. To the east, a connection may be possible to the dumbbell roundabouts at the junction of the A2 / A256, or at some point between this junction and the Whitfield Roundabout. The advantage of new connections to the A2 would be the reduction in traffic on current residential roads which connect to the new development areas. These connection points would need to be considered in detail as the planning process progresses.

The route which the BRT uses to connect to the wider road network will require consideration. If providing new connections onto the A2, these would be the fastest route for the BRT. However, the result of this would be a route which could bypass the existing settlement totally. A route which passes along Archer's Court Road, for example, would maximise connection with the existing settlement, but increase journey times. It is expected that the BRT will be operational at an early stage of development, and will route initially via Archers Court Road.

The level to which the BRT successfully connects Whitfield to Dover will depend ultimately on the frequency and characteristics of the service being provided. The frequency needs to be tailored to meet the demands of the passengers. If the frequency is too low then the BRT will not provide an adequate connecting service, with passengers choosing other modes above the BRT. A frequency which is too high will provide a highly connected service, but at a large cost which may be too great to maintain leading to cuts in service at a later date. A typical headway for a BRT system is 10 minutes at peak times, reducing to 15 minutes at off-peak times. The frequency needs to maximise the convenience of a 'turn-up-and-go' service where passengers do not need to rely on timetable information.

In some cities it has been possible to provide both express services and local, stopping services along the same BRT corridor with passing areas provided, typically at bus stops. Whether this is feasible or appropriate, and whether there is enough space for the infrastructure would need to be decided during detailed design and later masterplan stages. It may be that a stopping service operates as a circular service around Whitfield linking new and old residential areas, then providing interchange with the express bus at strategic locations.

6.2.5 Strategic Walking and Cycling Routes

Manual for Streets sets out some common requirements for pedestrians and cyclists, which should be considered at the design stage:

- Routes should form a coherent network linking origins and key destinations and should be of a scale appropriate to the user;
- Networks should allow people to go where they want, unobstructed by footway parking, street furniture, vegetation and other barriers to movements;
- Infrastructure should be safe and perceived to be safe, from both traffic and crime; and
- The environment should be attractive, interesting, integrated with the surroundings.

Cycle and pedestrian routes should be designed to meet these principles. Where routes meet roads the correct form of crossing should be provided without deviation from the most direct line. They should be designed to the highest standards of inclusive design including dropped kerbs, blister paving, audible warning and rotating cones. The most important strategic routes should also link to the existing residential area, as discussed in Section 6.2.3.

Footways should be a minimum unobstructed width of 2m and be surfaced to a high quality. In areas where people may congregate, for example at bus stops or shops, or on approaches to schools where people tend to walk in groups, footway widths should be increased to a minimum of 2.5m.

Cycle routes should be provided within the carriageway, especially in areas where speeds and traffic volumes are low. If more practical to provide off carriageway cycle lanes these should be segregated from footways if space allows. Evidence suggests that pedestrians can be intimidated by cyclists on footways, to the point they may chose not to walk.

BRT bus stops should be located at the confluence of the bus route and the main pedestrian / cycling routes. This is especially important where the routes provide linkage to the existing residential areas to maximise the benefit of the BRT for existing residents. Along these routes there should be clear way finding and signs, with walking and cycling times rather than distances provided.

6.2.6 Routing and Priority

The BRT will need to be as fast a service as possible. The number of stops should be kept to a minimum and the route should link the stops as quickly and directly as possible. However, consultation on the BRT proposed for Fareham, Hampshire, highlighted concerns that people may drive and park in residential streets along the route if the stops are not easily accessible. As a result of this consultation additional stops have been proposed. This highlights the balance which needs to be achieved between providing a highly connected network where all residents have easy access to the service, and an express service providing rapid connection to Dover.

The route which the BRT takes through the new urban areas will dictate how accessible it is to new and existing populations. Space and journey distance will govern to what extent the route can pass through the existing settlement. Figure 6.10 shows two possible alignments of the BRT route through the new urban area, where space can be provided for whatever infrastructure is required.

The red route is more direct and would serve the new residential areas but because it is located further into the new development, it is less accessible to the existing population. The blue route is longer than the red route, but is located closer to the existing residential area; therefore more of the current residents will be within 600 to 800m of the route.

Figure 6.10 – Alternative BRT alignments

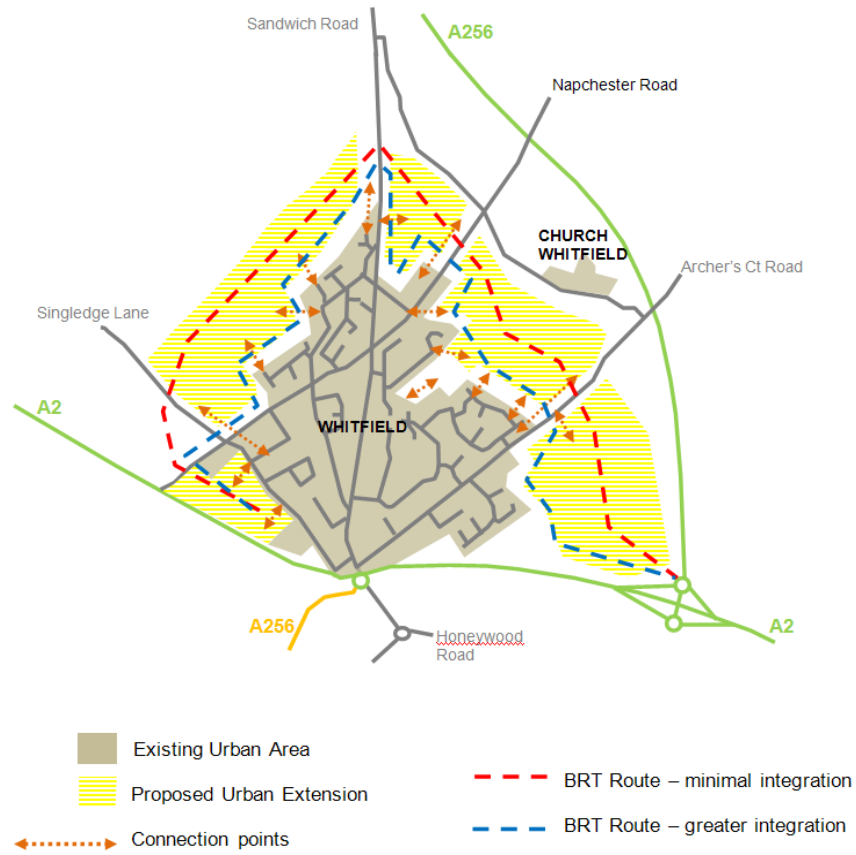


Figure 6.11 – Approximate 600m walking distance from BRT route

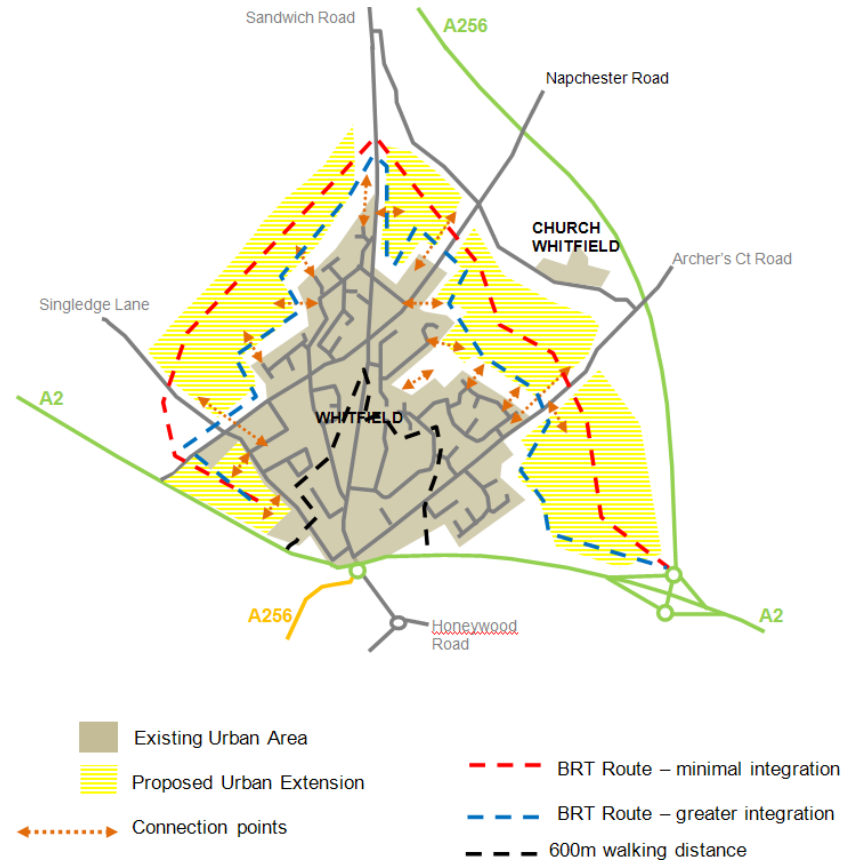


Figure 6.11 gives an indication of which parts of Whitfield are within 600m of the edge of the existing urban area, as indicated by the black dotted line. The figure indicates, though this is a very rough measurement, that apart from the very core areas, much of the residential area is within 600m. The bulge to the east of Sandwich Road illustrates well the lack of connectivity created by cul-de-sacs and estate roads. Routes on this side of the village are less direct and as a result a person on foot is not able to penetrate as far into the urban area. Considering routing the BRT along Archer's Court Road means that all of the existing area then falls within 600-800m of the BRT route.

It may be most appropriate to provide guided bus-ways through the residential areas of Whitfield. Because the bus is guided and kept between upright kerbs there is no need to allow space for the bus to wander, as is required for buses operating on conventional roads. As a result a guided bus-way need only be slightly wider than a bus width in each direction meaning they can be accommodated in areas where space is less available and could operate through the heart of the residential development (can slip between developments or behind them). This could be important in integrating the BRT into the existing development where space is more limited.

Figure 6.12 – Illustration of a Guided Bus-Way



The bus service needs to be given priority as it travels through the residential areas, so not to be delayed. Any delay experienced by the bus will increase journey times and make it less attractive to use. Rapid and reliable BRT is best achieved when buses run along dedicated routes, removing the effect of congestion during peak periods.

Where a bus-way needs to cross roads used by general traffic the bus would receive priority utilising modern technology and sensors set within the bus-way to detect vehicles on approach to a road or junction, which would then stop general traffic allowing the bus to cross without stopping, as shown by Figure 6.13. Similar technology is used on tram systems and could also be used where the bus needs to rejoin the road network and when approaching junctions on the road network. Separate bus-ways, as opposed to bus lanes generally allow the vehicles to achieve higher speeds.

Figure 6.13 – Bus Priority Signals to stop general traffic and allow buses through



Providing bus priority using bus lanes requires more space and results in wider carriageways which are less attractive to pedestrians and increase the sense of dominance of roads. As with a guided bus-way priority at junctions would be given to buses to allow them through the network without stopping and delay.

Intelligent Transport Systems (ITS) should be utilised widely across a BRT network:

- Automatic Vehicle Location (AVL) can be used to pinpoint bus locations on the network. This allows real time passenger information to be provided, but can also improve operation as it is possible to respond quicker to incidents and disruptions.
- Signal Priority, whether provided by GPS technology to track buses on approaches to junctions, or through detectors, can be used to hurry buses through the network. Advanced or extended green times for buses reduce delay and variance in journey time, as well as improving reliability. Effective priority can reduce journey times by around 10 percent.
- Electronic ticket payment using systems similar to Oyster can reduce dwell times at stops, reduce driver distraction and can allow multi-point payment on vehicles with more than one entry point.
- Guidance technology can control the position of buses within the carriageway, thus improving safety, can control speed and can be used to track buses into stops so they stop in exactly the correct place, which can assist boarding / alighting for the mobility impaired.

6.2.7 Vehicles and Ticketing

High quality vehicles are essential for a successful BRT system, and especially so for Whitfield where it is hoped the BRT will replace car based journeys. Clean technology, with low floor accessible buses should be used along the route to appeal to passengers. The most appropriate vehicle design will take into account a number of different considerations including:

- Capacity

- Ease of passenger entry and exit;
- Comfort;
- Circulation space and ease of movement on the bus;
- Route constraints such as turning space and gradients; and
- Reduced noise and emissions.

The vehicles should convey the identity and image of the BRT system so should be branded / coloured accordingly, including vehicles and bus stops. The form of the stop itself can help to portray a sleek, modern, fast service.

A high quality bus vehicle will convey a high quality image which can encourage use. A dedicated bus fleet to serve the BRT would probably be desirable. The service is intended to be rapid; therefore considerations such as the number of doors can become important. If there is a high passenger demand providing vehicles with more than one entry point can reduce dwell time at stops and reduce journey times. This will affect the amount of space on the footway required for bus stops and facilities.

Similarly the arrangements for ticketing can have knock on impacts on journey times, dwell times and stop design. On-board fare collection as is typical on buses currently operating in Dover minimises operating costs as the driver is the revenue collector. It is perhaps best used at low passenger volume stations and at off peak times. Collecting fares on board at peak times where passenger boarding is high can significantly increase dwell times, especially where money changes hands. Off vehicle fare collection is more desirable at major boarding locations or during peak times, which means passengers can board the bus much more quickly. This reduces dwell times and travel times. Smart tickets, such as electronic Oyster cards, and passes would speed up the ticketing process and could be linked to through ticketing for trains and other bus services. The local bus operator already sells annual, monthly and weekly tickets, either for Dover itself or for the wider area. Ticket prices for the BRT should be in line with prices for other services in the town.

6.3 BRT Stops and Immediate Environment

6.3.1 The Stop

To ease access to the BRT, 90 percent of the development should be within 600-800m of a bus stop. Providing stops to meet these criteria may require a significant number of stops along a route which will detract from the express nature of the proposed service. Achieving an acceptable balance between the number of stops and the distance between stops and homes will be important to get right as passengers wishing to get to the town centre or the station as quick as possible will not be tolerant of a frequently stopping service.

The location of bus stops should be considered at a relatively early stage in development of the masterplan and road layout. It can be useful to consider bus stops as interchanges between bus and walking modes, which can assist in deciding on the best locations for stops along a route.

It is of paramount importance that the BRT stops are easily accessible on foot and by cycle. The ideal of the BRT is a quick and convenient alternative to private car travel, therefore easy access to stops is vital. Stops should be located close to junctions or local trip attractors to pick up multiple pedestrian routes, though this needs careful consideration so not to cause visibility problems for motorists.

Transport for London's *Accessible Bus Stop Design Guidance* (2006) lists a number of features of the bus stop and environment which are considered important. Some of the most relevant features are:

- Connectivity with footways;
- Bus passenger shelter and seating;
- Bus stop post and flag;
- Security and lighting;
- Ticket machines or purchase on bus facilities;
- Information including real time information, maps or timetables;
- Drainage; and
- Design features including kerbs, the swept paths for buses in and out of a stop, space to allow buses to straighten up to the kerb; surface markings and number of stops.

These should be provided for the BRT as a minimum. On large scale BRT systems the stops are designed to look more like rail stations than bus stops, however for Whitfield traditional bus stop design is more appropriate. The shelters should be of a high quality design so they can become a feature of the streetscape not just functional. As mentioned previously they should be branded and of a design which promotes the modern, fast nature of the BRT. Seating, lighting and real time information should be provided, and the stop should provide a high level of weather protection so passengers will use the BRT all year round.

Transport for London's *Accessible Bus Stop Design Guidance* (2006) list a series of objectives which bus stop design should achieve. These are to:

- Allow easy, unobstructed access to and from the stop;
- Minimise the time the bus needs to spend stationary at the stop;
- Prevent other vehicles from parking in the bus stop or adjacent to the stop so to prevent easy access for the bus;
- Allow the bus to line up parallel to the kerb and within 50mm of it; and
- Remove street furniture which may obstruct passengers.

Because the BRT is intended to provide a fast, reliable, high quality link between Whitfield and Dover town centre and station, it is anticipated that demand especially during peak times, will be high. This means that the stops being provided and the shelters would need to be larger than normal. Depending on expected patronage levels it may be necessary to provide longer vehicles to increase capacity, or, vehicles with more than one entry point to minimise dwell times. These issues will need to be considered at the design stage so stops can be designed accordingly. If tickets will need to be purchased before boarding to reduce dwell times, then ticket machines will also need to be provided at the stop.

In planning the BRT and the location of stops, the planner needs to constantly remember that the purpose of the BRT is to link Whitfield to Dover, not to operate as a local stopping service.

6.3.2 The Stop Environment

Footways at bus stops should be finished to a high quality and wide enough to allow passengers to wait without impeding the pedestrian movement along the footway. Crossings should be provided as close to stops as possible to allow pedestrians to cross safely after alighting. This also requires careful consideration as crossing in front of a bus delays the service, and crossing either from in front of or behind a bus can have visibility and safety problems. Conversely, locating a crossing point too far from the bus stop will cause informal crossing which may give rise to other safety issues.

Consideration could be given to providing some cycle parking at bus stops to make the journey to bus stops easier and quicker. This should certainly be considered if passengers are not allowed to take cycles on buses, which can affect bus capacity at peak times. If provided, cycle parking should be sited so not to be a hazard or impede access, be covered and secure in an overlooked area for security.

Bus stops must be strategically located to maximise patronage and visibility of the service. With branding and image being of importance to the BRT then the bus stop environment needs to be designed to the highest quality, with good lighting and natural surveillance. Within the town and along the route between Whitfield and Dover, the BRT will need to serve key local services and employment sites. In Whitfield itself the emphasis should be on key locations where stops will serve the greatest number of passengers, and where the bus route intercepts key walking and cycling routes.

The stops need to be highly visible. This is both as pedestrians and cyclists approach them the location is obvious and that there is good surveillance to provide a sense of personal security. Visibility is also important from the stop outwards. Stops that are located near to or are obscured by obstructions, blind corners or vegetation can feel isolated and heighten a sense of personal insecurity and be detrimental to the use of the BRT, particularly outside the peak hours.

The BRT stop provides the interchange between walking/cycling and public transport. As there needs to be a balance between the distance between stops in order to maintain the express nature of the service, cycling could be seen as a quick and convenient mode for connecting the home and BRT. Therefore, it is important to include incorporate high quality cycle parking and storage at or with a very close proximity to the stop.

6.3.3 Information Strategy

The provision of reliable information relating to journey times, whether from the home to the stop, stop to destination or the expected timing of a service (arrival at the stop or destination) is a critical to the successful take up of public transport over the private car. A universal criticism of bus based public transport relates directly to the reliability of journey times and lack of information and knowledge about when a bus might actually turn up at the stop.

The image and identity of the BRT is very important. In many cases BRT systems have been branded and the brand identity is closely linked to the quality, reliability, frequency and speed of the service. In Whitfield, the service is intended to replace car journeys, therefore needs to be delivered to a very high standard. Marketing will be important to encourage use, but it will be the actual operational characteristics of the BRT will keep passengers using the service.

Real time passenger information systems both at the stop and key locations (either along a connection route or in public spaces and buildings) play a key role in providing the passenger with the information they need to plan their journeys and day with confidence.

The BRT needs to be as easy and straightforward as possible to use. Wayfinding needs to be clear, whether by design of the residential street layout, or through a signage strategy. If providing signs to bus stops these should use walking times rather than distances, and should be regularly maintained. As discussed previously a street layout with many cul-de-sacs and winding roads is less legible than a simple grid system which is far easier to understand and to navigate on foot.

A high frequency service removes the need for a timetable allowing passengers to turn up and go which increases convenience. Real time passenger information which can be provided at stops, via SMS mobile phone technology, online and potentially in the home through smart points will further increase the convenience of the service.

6.4 Relationship with Car Parking Strategy and Standards

The BRT is intended to replace car journeys into the town centre, and prevent external travel to other local centres, such as Canterbury, for services which can be provided in Dover. Achieving this will require complementary measures to be brought in to discourage driving and parking in town centres.

An unlimited day rider ticket for Dover is currently £3 per person, with the cheapest basic return ticket costing £1.10, or 60p for a single. An annual bus pass would cost around £420.

By comparison, the cheapest short stay parking per vehicle is 80p per hour for a maximum stay of 2 hours. Albany Place provides the cheapest long stay parking at £2.50 per day, or at other town centre car parks it is £6 per day. Pre-paid long term parking is available at Russell Street at £3.75 per day. An annual parking permit costs £340.

The difference in cost between parking a car in Dover and travelling by bus is not significant enough to discourage driving, especially if more than one person is travelling. If travelling into Dover for 2 hours to shop, the car is cheaper and much more convenient. The current bus service provision is not attractive enough to overcome the small increase in cost to drive. There is ample parking available so lack of spaces does not act as a deterrent to driving. Similarly, apart from at peak times congestion in the town centre is not a significant issue and there are no bus priority measures which makes travel on buses quicker than vehicles.

To maximise patronage of the BRT from Whitfield the ticket pricing needs to be attractive, but in addition parking prices in Dover should be increased, or provision reduced, to make bus travel the better option. This needs to be carefully balanced to not push people towards other local centres. This will link into the masterplan and economic planning which will need to provide all of the facilities and services within Dover so people do not need to travel elsewhere.

Minimising the parking provided within the new development areas can be a tool which reduces the need to travel, widens travel choices and reduces congestion. Parking standards can directly influence and manage travel demand and choice, encouraging sustainable modes of travel such as the BRT. Excellent accessibility by public transport, which is what the BRT will provide, is a key consideration when deciding if parking standards can be reduced.

The Dover District Council Core Strategy, adopted in February 2010, provides minimum parking standards for dwellings as follows:

- 1 and 2 bed flats: 1 space per unit;
- 1 and 2 bed houses: 1.5 spaces per unit; and
- 3 and 4+ bed houses: 2 spaces per unit.

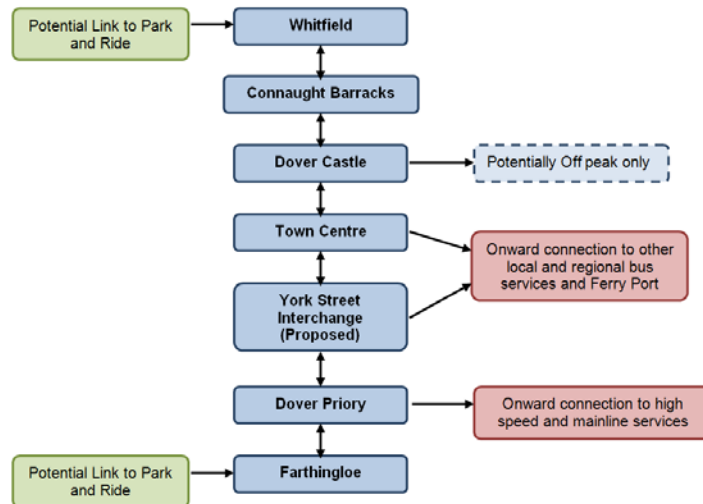
The notes which accompany the parking standards state that

Reduced, or even nil provision is encouraged in support of demand management and the most efficient use of land.

Reduced parking allocations need to be carefully managed to prevent on-street parking which can affect pedestrian and cycle comfort. Parked vehicles along bus routes can cause delay which must be avoided along the BRT route.

7. Summary and Conclusions

The Dover Bus Rapid Transit (BRT) system is an important element of the future public transport system in Dover. The service will operate between Whitfield, the town centre and Dover Priory rail station, potentially extending in the future to a park and ride site at Farthingloe.



Whitfield is earmarked within the Dover District Council Core LDF Strategy (adopted February 2010) for major housing development, totalling nearly 6,000 new homes. The BRT is intended to be a high quality express service which links the new development to the town centre and the station, providing a realistic and sustainable alternative to private car use. Without a realistic alternative, congestion will worsen and new residents may choose to travel elsewhere for employment or retail, meaning Dover itself gains little benefit from the development. The key objectives for the BRT are as follows:

- The BRT should be a fundamental feature of the development at Whitfield;
- The BRT should be fast, have maximum priority, directness and reliability; and
- As far as is possible the BRT should be integrated into the existing settlement.

This report has set out a number of key design principles which should be adopted as the masterplan for Whitfield, and planning for the BRT progresses. These include:

- The Whitfield development must be a walkable with pedestrians at the top of the road user hierarchy;
 - BRT stops should be prominent features within neighbourhoods, located at neighbourhood centres and on the confluence of cycling and walking routes;
 - Information on the BRT should be readily available in public places and in the homes;
- The number of stops should be kept to a minimum to maintain the express nature of the service; and
- A minimum of 90 percent of the development should be within 600m to 800m of a BRT stop.

The last two bullet points illustrate the careful balance which needs to be achieved by the BRT between integration and accessibility, and speed. The more integrated the service is within new and existing areas the longer the route. Achieving greater accessibility means the need for more stops, which again will reduce the speed of the service. Getting the balance right is fundamental to the success of the BRT.

7.1 Delivery of the BRT

The BRT must be delivered at an early stage of the Whitfield development to establish sustainable travel patterns from the outset.

The first areas to be developed will be those to the south and west of the current settlement. A new vehicle access would be provided onto the A256 to the north of the junction with the A2. This access would connect through the site to Archers Court Road. A community hub will be commenced at the first stage of development, which will include a BRT stop. It is anticipated that the BRT will be deliverable with occupation of the 300th dwelling. Initially the BRT will operate along Archers Court Road until segregated bus-way or new masterplan road network is constructed. Bus priority measures could be provided at Whitfield Roundabout to ease the transit of buses and to make private car travel less attractive. By the time 1,200 homes have been occupied the BRT should be strongly established with links and connections into the new residential areas.

By the time 2,000 to 2,500 dwellings are occupied it is intended that the BRT will have been strongly established for some time. The BRT will begin to operate on new dedicated infrastructure over the A2, and between White Cliffs Business Park and Dover Road. The delivery of the link to Dover Road will need to be provided before completion of the Connaught Barracks development to ensure that sustainable travel patterns can also be established at the outset for this site.

By the occupation of around 3,500 homes the development would have extended to the north and west of Whitfield. A second access could be provided onto the A256, but the preferred option would be an access directly onto the A2. Potentially a park and ride site could be constructed at this access, served by a combined park and ride / BRT service which can accommodate visitors to the castle and western heights.

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