Brighton and Hove Area Strategy Development Plan

South Coast Corridor Multi-Modal Study

Prepared for

Government Office for the South East

August 2002

Halcrow Group Limited

In association with:

- Accent
- Chris Blandford Associates
- DTZ Pieda
- Baxter Eadie Ltd
- Sustainable Futures
- Camargue – PR media Consultants
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Halcrow Group Limited
Vineyard House 44 Brook Green London W6 7BY
Tel +44 (0)20 7602 7282 Fax +44 (0)20 7603 0095
www.halcrow.com

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Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed

Contents

1 Introduction

1 Introduction

1.1 *Background to the Strategy Development Plan*

1.1.1 The South Coast Corridor Multi Modal study (SoCoMMS) is being undertaken on behalf of the Government Office for the South East (GOSE). The study has developed a transport strategy for the South Coast between Southampton and Thanet. This in turn will be an important element of the Regional Transport Strategy being developed by the South East Regional.

1.1.2 The development of the transport strategy has made use of a strategic transport model, which has been specifically developed for SoCoMMS. The model represents an average hour between 0700 and 1900 and includes highway and rail network definitions. Travel forecasts have been developed for 2016 and 2030 and a range of transport measures have been tested, either in isolation or in combination.

1.1.3 The transport strategy that has emerged includes a range of interventions:

- local initiatives (public and private sector);
- local public transport improvements;
- strategic public transport improvements;
- targeted road improvements;
- freight initiatives;
- safety and mobility initiatives; and
- balance - demand management.

1.1.4 In order to provide further detail on the elements of the strategy, a series of Strategy Development Plans are being prepared. These include:

- South Hampshire;
- Chichester;
- Arundel;
- Worthing;
- Brighton and Hove;
- East of Lewes;
- Bexhill-Hastings; and
- Public transport.

1.1.5 The purpose of the strategy development plans is to investigate the performance of multi-modal measures at the local level. The plans will provide a feedback to the strategy development process by confirming the inclusion of key measures. The plans will provide greater detail on the measures and their appraisal. Where appropriate, an AST will be developed.

1.2 Measures identified in the Strategy

1.2.1 Within the Brighton and Hove area, the pertinent elements of the transport strategy are:

1.2.2 **The Local Initiatives-** A key element of the preferred strategy is to encourage use of sustainable travel modes, wherever possible. This will reduce overall levels of traffic growth, particularly in the peak periods. To achieve this much greater emphasis will be placed on Local Authority, Community and Business led initiatives such as:

- safer routes to school;
- travel awareness education;
- green travel plans;
- home working;
- internet shopping;
- locally based pedestrian / cycle / bus infrastructure improvements.
- better planning controls, imposing restrictions on car parking and ensuring that new developments are accessible for sustainable modes; and
- education programmes, highlighting potential alternatives to the car and implications of increased car use.

1.2.3 **Locally based Public Transport Improvements-** The strategy must provide greater choice for local movement. While the above will contribute to this there are a number of other measures that also need to be added. These include:

- improved interchange between walking, cycling, bus and rail, particularly at "hub" stations;
- improved information systems and improved access to bus services;
- provision of improved walk/cycle routes to schools, stations and town centres (to be implemented on a whole route basis);
- introduction of edge of city Park and Ride systems with a corresponding review of central area parking provision; and

- introduction of new or extended public transport systems.

1.2.4 **Strategic Public Transport Improvements**- At the strategic level, choice will be increased through enhancement of the rail network and its services. The strategy seeks, not only to improve the rail journey but also to focus on access and egress at stations so as to provide for the 'whole' journey. This should include

- frequency enhancements on the local east-west rail services, dividing the corridor into three overlapping sectors, focused around South Hampshire, Brighton & Hove and East Kent;
- introduction of fast through services linking Southampton to Ashford, to provide a corridor for strategic movement with intermediate stops at key hubs stations which allow interchange between local, through and London based rail services / local bus services / the cycle and, at non town centre stations, the private car;
- introduction of a number of new stations to facilitate interchange to serve new developments and to act as Parkway stations;
- provision of additional platforms at a limited number of stations to facilitate the running of mixed services;
- the introduction of new chords to allow more flexible train routeing;
- double tracking the railway line as appropriate and introducing passing loops at selected local locations; and
- all to be supported through station based access and quality improvements and rolling stock enhancements

1.2.5 **Targeted Road based Improvements-** For the preferred strategy to be effective it must address the issues associated with car dependency. Continuing commitment to a predict and provide culture is therefore not an option. Nonetheless, there is currently severe traffic congestion at many locations along the A27 Trunk Road and this is predicted to worsen in the future. This will make it more difficult for business and freight operators to gain access to many of the South Coast towns from the national road network.

1.2.6 After considering all available options the development of the strategy concluded that these problems can only be addressed through localised highway improvements. These being solely aimed at the bottlenecks that cause congestion. The strategy should therefore include a limited number of measures to improve the current road network's overall efficiency. These include:

- improvements to the operation of the M27;
- removal of bottlenecks on the A27 between Havant and Polegate;
- improvements between Bexhill and Hastings;
- improvements to the eastern approach to Dover

In addition to the above, there may be a need to provide small scale safety and environmental improvements as and when needed.

1.2.7 **Promotion of Rail and Sea Based Freight Initiatives-**It is recognised that the majority of freight movements within the South Coast corridor will continue to be made by road. Nonetheless the strategy should promote and facilitate, the transfer of freight movement from road to rail and sea. In particular the strategy should seek to encourage further use of rail and sea through encouraging:

- freight quality partnerships;
- rail access to ports;
- transhipment of selected international freight between international and coastal shipping; and
- further use of coastal shipping for bulky goods (building materials, etc)

1.2.8 **Promotion of Personal Safety, Road Safety and Accessibility for the Mobility Impaired-**In accordance with general government policy and good design practice all strategy measures should be designed to promote personal safety and aid movement for the mobility impaired. To ensure that this is achieved the overall strategy should be taken forward within the context of an agreed mobility impaired accessibility policy to be developed through consultation with local groups and organisations.

1.2.9 **Ensuring Balance-** Each of the above strategy elements will only be effective if a state of equilibrium is achieved between the demand for travel by car and other modes of transport. To ensure this, the strategy must have at its core measures that seek to control the overall level of future car usage, particularly in locations where there are, or will be, good alternative transport systems. All of the above measures should therefore be introduced within an overall policy regime that includes:

- significantly increased long stay public parking charges within each of the South Coast towns, using a fee hierarchy that reflects the town's status;

- increases to short stay public parking charges so as to encourage off-peak modal transfer to public transport and park and ride;
- a levy on all private workplace parking spaces in core urban areas, together with all parking spaces in "out of town" retail parks along the South Coast; and
- car based cordon charges for entry into the major conurbations of Southampton, Portsmouth and Brighton & Hove so as to encourage use of the new Park and Ride facilities.

1.3 ***The Brighton and Hove Strategy Development Plan***

1.3.1 This particular report is exclusively concerned with the strategic assessment of a range of improvements to a number of possible public transport infrastructure to, from and within the Brighton and Hove area, over the long term perspective of the next 20 to 30 years.

1.3.2 Conventionally, particularly for new public transport schemes, likely patronage would be determined by use of stated preference techniques, detailed home interview and origin-destination surveys and counts of existing passenger demand. Such a comprehensive analysis is not possible given the limited time frame as well as the limited data availability for the current assessment. However, given the strategic context of this study, a higher level approach can justified as the first step in the process to identify possible improvements which would warrant further analysis.

1.3.3 Currently with a population of 260,000 residents, the local geography of the Brighton and Hove area poses particular problems in terms of urban growth and infrastructure provision. Bounded to the south by the coastline and to the north by the South Downs, an Area of Outstanding Natural Beauty (AONB), transport access is constrained to a restricted number of corridors. In general transport accessibility is provided by east-west corridors, as well as a limited number of north south routes through / over the local topography.

1.3.4 In order to meet growing demand for travel in Brighton and Hove, the study has examined public transport improvements in a number of key corridors in the area including:

- A23: city centre north to the junction with the A27 at Patcham

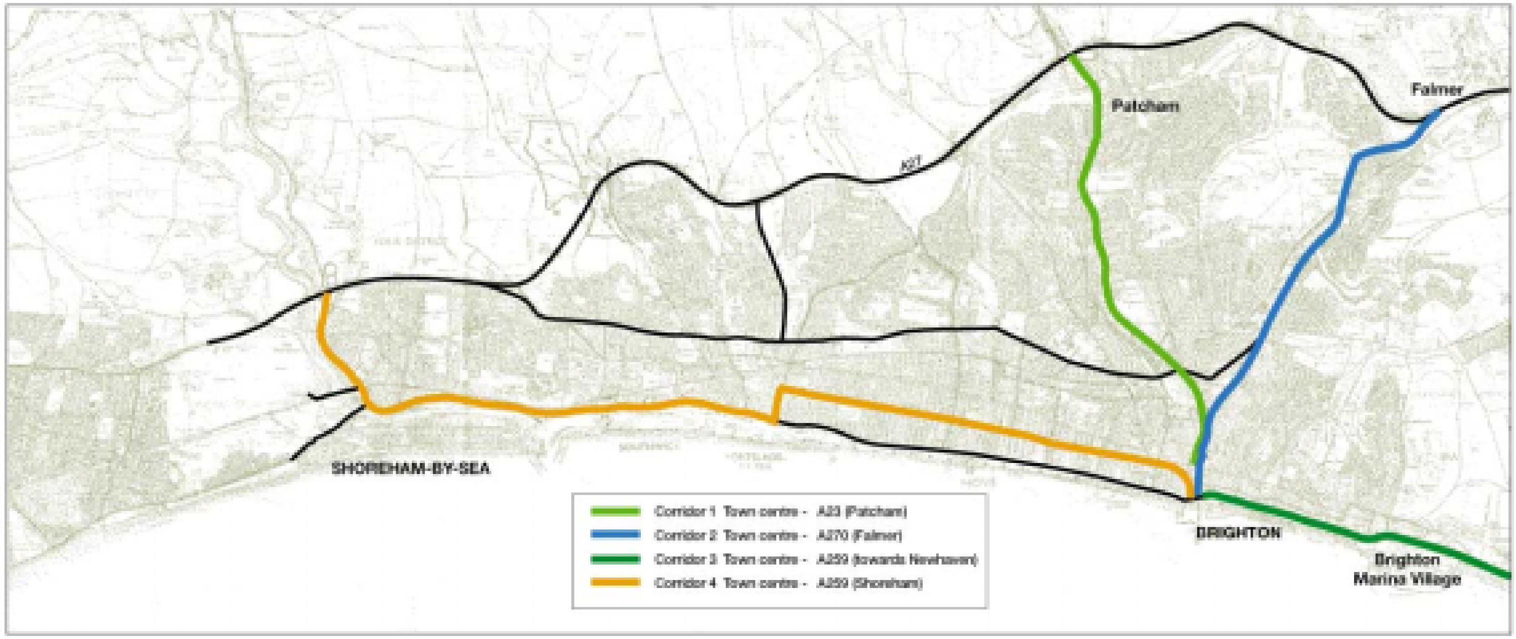
- A270: city centre to Falmer

- A259 east: city centre towards Newhaven

- A259 west: city centre to Shoreham

1.3.5 These study corridors are consistent with local policy, representing four of the five identified Sustainable Transport Corridors in the Local Transport Plan. It is intended that all public transport improvements will integrate with the existing transport network in the area to facilitate multi modal movements and to ensure maximisation of efficiency in the use of the total transport network.

1.3.6 The route options are shown in Figure 1.1. A strategic technical, economic and financial appraisal of improving public transport in these corridors is assessed herein



Brighton Public Transport Improvements – Route Corridors

Figure 1.1: Brighton and Hove Route Corridors

2 Option Assessment and Costing

2 Option Assessment and Costing

2.1 *Introduction*

In this section the public transport improvement alternatives are discussed. This includes a brief overview of the technical and operational characteristics of the proposals as well the capital and operating costs involved.

2.2 *Option Assessment*

The current study examines the following transport corridors within the Brighton and Hove area:

- A23: city centre north to the junction with the A27 at Patcham – route length 6km
- A270: city centre to Falmer – route length 6km
- A259 east: city centre to Roedean School and potentially further east towards Newhaven – route length 3km to Roedean School and 14.5km to Newhaven
- A259 west: city centre to Shoreham – route length 12km

For each of the corridors, three possible public transport improvements have been assessed. These include:

- Enhanced Bus
- Light Rapid Transit (LRT)
- Guided Bus

For all options, the proposed solutions would involve predominantly on-street running and thus would be competing with both cars and buses for operational road space. The degree of segregation would be specific to each alternative. The technical characteristics of each alternative are briefly described below.

2.2.1 Enhanced Bus

Brighton and Hove currently has initiated a range of improvements to the local bus service. These include:

- Improvements to bus route planning
- Simplification of fare structures
- Improved passenger information systems
- Replacement of buses and to bus infrastructure

The Enhanced Bus proposals, as assessed here, attempt to build on these ongoing improvements, the aim being to increase the relative attractiveness of bus compared to car. In the current appraisal the Enhanced Bus option includes the following:

- Upgrading and improving bus stops along the study corridors
- Further extension and consolidation of existing bus lanes along the study corridors
- Continuation of the ongoing bus fleet renewal

It has been assumed that the above improvements result in a system operating speed of 25kmh. In terms of Corridor 3, A259 east, the analysis has assessed the viability of introducing the Enhanced Bus improvements all the way to Newhaven. This represents a distance of 14.5km. The costing assumptions for these proposals are outlined below.

2.2.2 Light Rapid Transit (LRT)

The LRT option proposes a service that would operate on all routes with a minimum frequency of 10 minutes. Furthermore, stops would be frequent along the route with a stop every 800m assumed. This stop spacing is based on the Consultants' estimate of industry norms. The system that is proposed is one similar to that developed in Manchester and is characterised by articulated twin vehicles operating on a twin track system with vehicles having a crush load capacity of 180 passengers in peak conditions. The other main operational assumptions are detailed in Table 2.1. Further technical and operational details would need to be determined at the next stage if further analysis is warranted.

Item	Unit
Operating speed	30 kph
Turnaround time	2 minutes
Station dwell time	40 seconds

Table 2.1: LRT Operating Assumptions

In terms of Corridor 3, A259 east, the analysis has assessed the viability of introducing the LRT improvements only to the outskirts of Brighton and Hove. Given the undulating topography as well as the reduction in traffic volumes, the LRT route is assumed to only go to Roedean School in the vicinity of Brighton Marina. This represents a distance of 3km. The costing assumptions for these proposals are outlined below.

Based on the above assumptions it is possible to derive the number of stations that will be required on each route as well as the level of rolling stock required to meet the proposed service obligations. Given the scope of the assessment, it is not possible to determine the precise location of stops on each route. However, it is assumed that stations will be located at key locations such as near major junctions, adjacent to transport interchanges or at other key pick up / drop-off locations along each corridor. In all likelihood, some stations will serve more than one line. This is particularly likely within Brighton and Hove city centre, however, in terms of costing, a conservative view has been taken which assumes each line has a unique set of stations.

The infrastructure requirements for each line, in terms of stations and rolling stock are summarised in Table 2.2.

Corridor	Stations	Fleet Size
A23: city centre north to A27	8	4
A270: city centre to Falmer	8	4
A259 east: city centre to Roedean School	4	3
A259 west: city centre to Shoreham	15	8
All Lines	35	19

Table 2.2: LRT Infrastructure Requirements

In order to house and maintain rolling stock, a depot will be required. The most likely location for this would be at Shoreham on the land below the grade separated interchange of the A27 and the A283 trunk roads. The capital costs of establishing such a facility are estimated to be approximately £25mn. These are incorporated in the capital costs assumptions discussed in section 2.3 below.

2.2.3 Guided Bus

As an alternative to LRT, a guided bus option has also been assessed. The same service frequency is proposed as per LRT, i.e. a minimum frequency of 10 minutes. In addition, the route distances for each corridor are the same as the LRT. The guided bus alternative has a lower functionality compared to the LRT in terms of reduced system capacity and operating speed. Moreover, it has less operational flexibility than the conventional Enhanced Bus option which has the ability to overcome congestion bottlenecks through free-running and overtaking. In the analysis the system is assumed to have an operating speed of 25kph and a crush load capacity of 160 passengers. Other operating parameters have been assumed to be as given in Table 2.1.

The implications of the system operating characteristics for costings are discussed below.

2.3 *Costing Assumptions*

2.3.1 LRT Capital Costs

Indicative capital costs have been derived based on engineering judgement with reference to recent other LRT schemes implemented in the UK, including Manchester Phase II, Croydon Tramlink, Midland Metro and Leeds. Given the level of detail available for the current study, it has not been possible to work up detailed estimates for each scheme and instead indicative costs per route kilometre have been applied. Based on the references above, an average cost of £10.5mn per km was assumed (2002 prices). This assumes a twin track system of operation.

Based on the above costing the total system cost is summarised in Table 2.3. Overall the capital cost of the whole scheme, for all four corridors, is estimated to be some £283mn in current prices.

Corridor	Cost (£mn)
A23: city centre north to A27	63.0
A270: city centre to Falmer	63.0
A259 east: city centre to Roedean School	31.5
A259 west: city centre to Shoreham	126.0
Total	**283.5**

Table 2.3: LRT Capital Cost by Corridor (2002 prices)

Source: Study estimates

The optimal opening year for the scheme has been determined based on the results of the economic appraisal which, based on an iterative process, calculates the opening year in which the scheme benefits (calculated over 30 years from opening) outweigh the initial investment costs. In terms of the profile of capital costs, therefore, the assumptions applied in the appraisal are as shown in Table 2.4.

Year	% Costs
Opening year (OY) –5	10%
OY –4	10%
OY –3	20%
OY –2	20%
OY –1	20%

Table 2.4: Assumed Cost Spend Profile

Source: Study estimates

2.3.2 Bus Capital Costs

Enhanced Bus capital costs were derived from the Consultants' experience as well as discussions with bus specialists at Brighton and Hove Council. The capital costs applied in the appraisal are summarised in Table 2.5.

Item	Unit	Cost (£)
Bus stop replacement	/item	7000
Bus lane provision (road widening)	/metre	1000
Bus lane (existing carriageway)	/metre	100

Table 2.5: Enhanced Bus Capital Costs

The analysis assumes that bus stops will be required every 400 metres and furthermore allowance has been made for their replacement once every five years.

In terms bus lane provision it is assumed that road widening to cater for bus lanes will only be possible in certain locations due to carriageway width restrictions. The analysis assumes only 1% of the study corridors have the capacity for carriageway widening to allow bus lanes, the remainder of the corridors are assumed to have bus lanes implemented within the confines of the existing carriageway. The total capital cost is subsequently derived by application of these relative weightings to the costs in Table 2.6.

Corridor	**Cost (£mn)**
A23: city centre north to A27	1.52
A270: city centre to Falmer	1.52
A259 east: city centre to Newhaven	3.67
A259 west: city centre to Shoreham	3.04
Total	**9.74**

Table 2.6: Enhanced Bus Capital Cost by Corridor (2002 prices)

2.3.3 Guided Bus Capital Costs

Capital costs for a guided bus system were assumed to be £4mn per kilometre. This is assumed to include the cost of providing all rolling stock, permanent way and other infrastructure required to operate the system. This estimate is based on a recent study comparing bus and light rail systems around the world[1]. The subsequent capital costs for the guided bus option are as shown in Table 2.7. In summary, a guided bus system for the Brighton and Hove area is estimated to cost £108mn.

[1] Bus or Light Rail: Making the Right Choice. A financial, operational and demand comparison of light rail, guided buses, busways and bus lanes, Carmen Hass-Klau, Graham Crampton, Martin Weidauer, Volker Deutsch, Bergische University, Germany

Corridor	Cost (£mn)
A23: city centre north to A27	24.0
A270: city centre to Falmer	24.0
A259 east: city centre to Roedean School	12.0
A259 west: city centre to Shoreham	48.0
Total	**108.0**

Table 2.7: Guided Bus Capital Cost by Corridor (2002 prices)

The assumed cost spend for the implementation of the scheme is as shown in Table 2.4.

2.3.4 LRT Operational Costs

Operational and maintenance costs have been derived based on engineering judgement with reference to other recent schemes implemented in both the UK and overseas. Overall, the indicative operational cost for LRT was estimated at £566k per km (2002 prices).

2.3.5 Enhanced Bus Operating Costs

Annual operating costs for the Enhanced Bus option include:

- Fleet replacement @ £142k
- Bus lane maintenance @ £100 per linear metre (incurred once every five years)

These costs are included in the appraisal.

2.3.6 Guided Bus Operating Costs

Guided bus operating costs were assumed to be 85% of the annual operating cost for the LRT. This equates to £480k per km (2002 prices).

2.3.7 Other Costs

In order to reduce car use in Brighton and Hove city centre and to encourage modal transfer to public transport, it is proposed that park and ride sites will be located at the end of each corridor, that is at Patcham, Falmer and Shoreham.

However, the precise location of these sites will be determined in the next phase if further analysis is warranted. No park and ride site has been assumed for the Roedean area. For the purposes of this analysis, a capital cost estimate of £1.6mn per site has been assumed. These costs are assumed to be incurred evenly over the three years prior to scheme opening.

The recurrent operational and maintenance costs for park and ride sites have been excluded from the analysis.

3 Traffic

3 Traffic

3.1 *General Approach*

In the context of this strategic assessment and in the absence of detailed traffic modelling to predict mode assignment, the only practicable approach to deriving demand was to estimate the number of passengers travelling on existing routes, along which the enhanced public transport would operate, and to predict the proportion of that traffic that will divert from either car or bus.

The methodology applied to estimate the level of potential patronage for improved public transport schemes in Brighton and Hove is outlined below.

3.2 *Current Traffic*

The confidence level that can be placed on the estimate of fare revenue is crucially dependent on assumptions regarding fares and on the reliability of traffic forecasts. These forecasts in turn, depend on the accuracy of growth indicators and the base year traffic estimate. Conventionally, particularly for new public transport schemes, the base year traffic is determined by stated preference techniques, detailed home interview and origin-destination surveys and counts of existing passenger demand. Such a comprehensive analysis was not possible given the limited time frame as well as the limited data availability for the current assessment.

Instead, the only realistic alternative method was to use vehicular volumetric count data at sites along the study corridors. These data were converted to passenger flows using vehicle occupancy assumptions contained in the Transport Economics Note published by the Department for Transport and Consultants' estimates.

Table 3.1 presents Annual Average Daily Traffic (AADT) data contained in the current Brighton and Hove Local Transport Plan. In addition, the table also shows the proportion of traffic that is represented by either car or bus. In the absence of more specific data, average modal split figures were applied from the Local Transport Plan traffic data. This information was supplemented by route specific bus patronage data obtained from local bus operators. In summary, car accounts for 80% of all road traffic and bus between 2-3% respectively.

Route	2000 AADT (1)	% Car (2)	% Bus
A23 – north	21500	80%	2.5% (3)
A23 - south	24400	80%	2.5% (3)
A270 - north	33500	80%	3.2% (3)
A270 - south	19100	80%	3.2% (3)
A259 – east	22700	80%	2.0% (2)
A259 - west	24000	80%	2.0% (2)

Table 3.1 Corridor Traffic Estimates and Modal Split Assumptions

Sources: (1) Figure 2-2, Brighton and Hove Council Full Local Transport Plan 2001/02 – 2005/06, (2) Table 9.2 Brighton and Hove Council Full Local Transport Plan 2001/02 – 2005/06, (3) bus operators.

Annual passenger flows were estimated as the product of vehicle flows by mode and vehicle occupancies. The average vehicle occupancy for cars was obtained from the Department of Transport's Transport Economics Note (Table 2/2) which estimates an occupancy of 1.54 per vehicle. The average vehicle occupancy for buses was based on the Consultant's estimate of 25 passengers per vehicle.

3.3 ***Future Year Traffic***

The estimation of future traffic levels has been determined by the application of growth factors derived from the Strategic Traffic Model. This model provides traffic growth factors based on future car restraint in the central Brighton and Hove area, together with increased central area parking charges. In quantitative terms, this is estimated to be 1.56% pa

The 'with car restraint' traffic growth scenario has been applied in order to be consistent with the main traffic modelling work undertaken in line with the development of the Preferred Strategy. Over 20 years this implies an increase in traffic by some 36%.

3.4 ***Traffic Assignment***

3.4.1 General

The estimation of traffic assignment, and the likely degree of modal shift, following the introduction of improved public transport infrastructure is the element of the analysis that is most difficult to assess. The proportion of car and bus passengers likely to divert to an improved public transport alternative is dependent on a number of factors, the most important ones being:

- the differential in fares between existing bus and the proposed alternative
- the differential between journey times offered by the improved public transport alternative and existing modes
- whether the improved public transport network is so designed that it meets the requirements of passengers in terms of their needs to get from their specific origins to their destinations
- the service frequency of the new service and the degree of integration with the existing transport network
- the level of direct competition from the bus network
- local transport policy measures including car restraint measures, the presence of bus priority schemes and the extent of parking and other road charging measures.

3.4.2 Light Rapid Transit

There is little firm evidence available from previous studies as to the likely level of diversion to a new improved public transport system. Table 3.2 provides an illustration of the wide range of diversion rates that have occurred with the provision of selected light rail, tram and guided bus scheme improvements in various cities around the world in recent years.

Location	**Transfer from car to public transport**
Paris (St Denis – Bobigny), France	4%
San Diego, USA	50%
Nantes (Line 1), France	37%
Sheffield, UK	22%
Birmingham, UK	2-3%
Leeds, UK	2-3%
Jongkoping, Sweden	6%

Table 3.2: Car Diversion Rates to Improved Public Transport

The high variation in modal shift between schemes is a reflection of the number of competing factors suggested above. The problem is that the contribution of each of the factors to the variations in percentage diversion is complex.

Given the level of uncertainty and the lack of a detailed local traffic model, the approach used in this study was to take a scenario based view which postulates different diversion rates for different modes which also vary by time of day. The assumptions utilised in the analysis for the proposed LRT are shown in Table 3.3.

	Peak	**Inter peak**	**Off peak**
Base Case			
Car	20%	10%	10%
Bus	20%	10%	10%
Low Diversion			
Car	5%	5%	5%
Bus	10%	5%	5%

Table 3.3: Road Traffic Diversion Rates to LRT

Source: Study estimates

The proposed increase in town centre parking charges, (£12 per day) as part of Preferred Strategy will act as a strong incentive for road users to seek alternative ways of travelling into Brighton and Hove during the peak period. This may mean that significant modal transfer could be realistically achievable.

3.4.3 Bus and Guided Bus

The level of modal shift following the introduction of enhanced bus and guided bus measures will undoubtedly be lower than that for LRT. Following a similar approach to LRT, a scenario based approach postulating a range of diversion rates was adopted. The assumptions utilised in the analysis for the proposed Enhanced Bus and Guided Bus are shown in Tables 3.4 and 3.5 respectively.

	Peak	**Inter peak**	**Off peak**
Base Case			
Car	2%	2%	1%
Low Diversion			
Car	1%	1%	1%

Table 3.4: Road Traffic Diversion Rates to Enhanced Bus

Source: Study estimates

	Peak	Inter peak	Off peak
Base Case			
Car	10%	5%	5%
Bus	10%	5%	5%
Low Diversion			
Car	5%	2%	2%
Bus	5%	2%	2%

Table 3.5: Road Traffic Diversion Rates to Guided Bus

Source: Study estimates

3.4.4 Induced Traffic

Predictions of induced traffic following the introduction of improved public transport infrastructure are difficult to make. This is because they involve a measure of judgement, based on the expected response of potential travellers to a reduction in the cost of road transport due to an improved public transport service or reduced road congestion. Induced traffic is only likely to be significant in those cases where the infrastructure investment brings about substantial reductions in transport costs.

Given the relative lack of detail in the traffic assignment analysis, a conservative approach has been adopted and the public transport improvements are assumed to lead to no additional / induced traffic.

3.4.5 Traffic Summary

Based on the above analysis and assumptions, the daily number of passengers using the LRT in its opening year (2020) was derived and this is summarised in Table 3.6. This indicates daily passenger levels between 7,500 and 10,000.

Corridor	**Daily Traffic (pax)**
A23: city centre north to A27	8100
A270: city centre to Falmer	10000
A259 east: city centre to Roedean School	7500
A259 west: city centre to Shoreham	7900

Table 3.6: LRT Ridership Summary 2020

The increased ridership for the Enhanced Bus improvements is estimated to be between 500-600 additional bus passengers per day on each of the four corridors in 2005. In the case of Guided Bus, the system is forecast to attract between 3700 and 5000 passengers per day in each corridor in 2020.

The traffic figures combined with the level of patronage estimated for future years form the basis of the economic appraisal which is discussed in more detail in the following sections.

4 Appraisal Methodology And Assumptions

4 Appraisal Methodology And Assumptions

4.1 *Introduction*

The methodology used to assess the viability or otherwise of the proposed public transport enhancement schemes has been based on the methodology developed by the UK Department of Transport concerning Guidance on the Methodology for Multi Modal Studies (GOMMS). This methodology has been applied to appraise other elements of the Preferred Strategy in the SoCoMMs study and allows for consistency in the comparison of alternative schemes.

The methodology has to address two fundamental questions:

- To what extent are transport costs increased by congestion within the Brighton town centre area?
- To what extent will the provision of improved / increased public transport capacity cause a shift in modal choice away from car use to public transport alternatives?

4.2 *Scheme Benefits*

4.2.1 General

The traffic forecasts by mode together with fare and road user cost assumptions are combined to assess the financial and economic benefits accruing to each scheme. In the economic appraisal, benefits to existing road traffic which remains with their original mode are estimated in terms of travel time and vehicle operating cost savings – these are so called "non-user" benefits. Benefits to users of the public transport system, in terms of travel time and vehicle operating cost savings, also accrue and form part of the overall social cost benefit analysis. There are likely to be other benefits such as improved comfort, convenience and service "image" but the magnitude of these benefits have not been estimated.

The financial appraisal includes an assessment of the increase in fare revenue following the introduction of improved public transport schemes. This includes an assessment of the level of fare revenue lost to existing public transport operators following a degree of modal shift from one transport mode to another.

The comparison of costs, benefits and revenues incurred or received in different years are brought to a common base for appraisal by discounting to a present day value. The Treasury's current preferred discount rate is 6% pa. In calculating total benefits and revenue a 30 year operation life has been assumed.

Finally, the price base year assumed in the analysis is 1998. Thus all costs and benefits in the appraisal are adjusted for inflation, back to the price level of 1998. Both assumptions are in accordance with current appraisal best practice as specified in GOMMS.

4.2.2 Calculation of Benefits

The following groups of travellers may be affected improvements in public transport infrastructure:

- existing public transport users who make use of the improved public transport;
- road users who, following the improvement, switch to public transport; and
- other road users who benefit form less congestion following the switch of some travellers to public transport.
- existing public transport operators who may incur reductions in fare revenue following a switch to alternative transport modes

Whilst the first group benefit from the improvements throughout the day, the second and third groups are likely to obtain the majority of benefits during hours of traffic congestion when the relative attractiveness of public transport is greatest. To assume otherwise would almost certainly over-estimate the benefits of public transport improvements.

The estimation of periods of time when mode switching is likely to occur is inevitably approximate. As a basic assumption it is assumed that these periods occurs predominantly in the peak period. The assumptions concerning modal shift by time of day are detailed in Table 3.3.

4.2.3 Time Savings

The introduction of improved public transport infrastructure will result in a certain proportion road users switching modes to take advantage of the improved level of service. The reduction of traffic on the road network means those travellers who do not change mode can potentially take advantage of a more reliable and efficient journeys due to a reduction in congestion levels.

The valuation of the perceived journey time benefit to 'non users' is the product of the number of minutes saved per journey and the perceived value of time. In the case of the former, journey time savings will be determined by increases in road speeds resulting from fewer vehicles using the limited available road space. In the absence of specific speed surveys and detailed speed flow curve analysis, a simplified approach has been utilised. This postulates do-nothing and do-something vehicle speeds for cars and buses respectively for the different public transport improvement options.

It is evident that road vehicle speeds are lower than might be currently observed. This is the result of increasing congestion between 2002 and the intervening years until scheme opening. Furthermore, the vehicle speeds improvements are in direct proportion the level of attraction of the new public transport service. It is evident therefore that the highest road speed improvements occur in the case of the LRT which is likely to attract the most traffic from the road network. The assumptions used in the analysis are shown in Tables 4.2 and 4.3 respectively.

Period	**Do nothing**	**LRT option**	**Guided bus option**	**Enhanced bus option**
Peak	10	15	13	11
Inter peak	10	15	13	11
Off peak	10	15	13	11

Table 4.2: Car Vehicle Speeds by Scenario (km/h)

Period	**Do nothing**	**LRT**	**Guided bus option**	**Enhanced bus option**
Peak	10	15	13	10
Inter peak	10	15	13	10
Off peak	10	15	13	10

Table 4.3: Bus Vehicle Speeds by Scenario (km/h)

In the case of the Enhanced Bus option, it has been assumed that vehicle speeds on the existing network increase slightly from 10km/h to 11km/h due to the minor reduction in congestion on the existing road network.

Journey time savings accruing to scheme users will be determined by a comparison of relative journey times in the do-nothing and do-something cases. This compares journey times in the do-nothing case based on a road based trip to a do-something case based on a public transport trip. The do-nothing journey time is derived by application of vehicle speeds shown in Tables 4.2 and 4.3. The do-something journey time is derived by application of the operating speed shown in Table 3.1.

The value of time per vehicle hour for non scheme users was derived following the principles and assumptions described in the Transport Economics Note published by the Department for Transport. Combining assumptions concerning the perceived cost of travel, the proportion of work and non-work time and vehicle occupancies; the value of time per vehicle is calculated as follows:

- Car - £0.96 per vehicle hour

- Bus - £5.47 per vehicle hour

GDP/head is forecast to increase at 2.0% pa. Therefore, the value of time is forecast grow by the same amount per year for the entire evaluation period.

4.2.4 Vehicle Operating Costs (VOC) Savings

Savings in operating costs will accrue to both non-users and scheme users. In the case of non-users, savings occur as a result of reduced road congestion allowing more reliable and efficient journeys. These savings are derived by the product of the unit value of VOC and the distance travelled. Due to improvements in vehicle speeds in the do-something case based on the assumptions in Tables 4.2 and 4.3, the unit value of VOC is lower due to improved fuel efficiency and reduced wear and tear resulting in lower maintenance costs. Furthermore, the reduction in the number of road vehicles caused by some degree of modal shift to public transport means a net reduction in the number of vehicle kilometres.

In the case on scheme users, the introduction of improved public transport means a saving of the do-nothing VOC will occur. These benefits have been included in the analysis.

The quantification of vehicle operating costs for different vehicle types at different running speeds were derived using the principles and assumptions described in the Transport Economics Note, published by the Department of Transport.

4.2.5 Revenues

Clearly, estimates of fare revenues are critical in assessing the financial returns to the scheme. Revenues are the product of patronage and fares and these two parameters are inter-related. The higher the fare, the lower the demand.

Given the level of detail available for the current study, it is not possible to model the elasticity of demand for travel on the public transport improvements with respect to different unit fare levels. A simplified approach has therefore been adopted, based on existing bus fares in Brighton and Hove.

Currently, the fare for a single bus journey in central Brighton is £1 per trip. Given faster and more reliable journey times together with improved ride quality offered by either LRT, it is not unreasonable to expect potential passengers to be willing to pay a premium over and above the existing bus fare to use the improved public transport. The assumptions used in the appraisal are summarised in Table 4.1.

Option	**Unit fare (£)**
Existing bus	1.00
LRT	1.20
Guided bus	1.00
Enhanced bus	1.00

Table 4.1: Fare Assumptions (2002 prices)

GDP/head is forecast to increase at 2.0% pa. Therefore, the real cost of fares has been assumed to grow by the same amount per year for the entire evaluation period.

The appraisal calculates the additional revenue accruing to the operator of the improved public transport alternative. However, as discussed earlier, a proportion of this traffic is assumed to have switched from existing bus services. Therefore in order to quantify the full impact of the public transport improvements, the net loss in revenue to existing bus operators is also included in the appraisal.

4.2.6 Other Benefits

A key element in the strategy to persuade road users to switch to the improved public transport alternative is the provision of park and ride sites at key locations on the outskirts of Brighton and Hove and Shoreham. In order to use the park and ride facilities, road users will, in all likelihood, pay a parking fee, however, this potential revenue has been excluded from the current analysis as it is likely to only represent a transfer payment given that car users would pay to park in the town centre in the without project case.

5 Appraisal Results

5 Appraisal Results

5.1 ***Enhanced Bus Option Assessment***

The results of the economic assessment for the Enhanced Bus improvements are shown in Table 5.1. The scheme is assumed to become operational in 2005 and is tested for a 15 year evaluation period. The results indicate that for all corridors the economic returns are sufficient to justify the initial investment costs. This is confirmed by the benefit-cost ratios which range from 1.34-1.61. Overall, the NPV for all corridors combined is £11.4mn.

Corridor	PVC	PVB	NPV	BCR
A23: city centre north to A27	3.65	4.89	1.25	1.34
A270: city centre to Falmer	3.65	5.61	1.96	1.54
A259 east: city centre to Newhaven	7.46	11.70	4.24	1.57
A259 west: city centre to Shoreham	6.34	10.24	3.90	1.61
Total	21.09	32.44	11.35	

Table 5.1: Economic Appraisal Results – Enhanced Bus Base Case (2005 opening year)

5.2 ***Light Rail Scheme Option Assessment***

The results of the economic appraisal for the LRT scheme are presented in Table 5.2. Based on the comparison of costs and benefits, the LRT scheme is estimated to be economically justifiable by 2020. The results are disaggregated by corridor and all routes produce positive results. Overall, the NPV for the entire scheme is some £17mn.

Route	PVC	PVB	NPV	BCR
A23: city centre north to A27	30.23	32.60	2.37	1.08
A270: city centre to Falmer	30.23	40.01	9.78	1.32
A259 east: city centre to Roedean School	14.90	15.30	0.40	1.03
A259 west: city centre to Shoreham	60.04	64.73	4.69	1.08
Total	135.40	152.64	17.24	

Table 5.2: Economic Appraisal Results – Light Rail Base Case (2020 opening year)

The results of the financial appraisal for the LRT scheme, assuming an opening year in 2020, are summarised in Table 5.2. All routes produce a net operating surplus (total discounted revenues minus discounted operating costs) of between £8.8mn and £40mn. Overall the financial return for all corridors combined results in a financial surplus of some £52mn.

Route	Operating cost	Net revenue	Surplus/ deficit
A23: city centre north to A27	11.785	20.650	8.865
A270: city centre to Falmer	11.785	24.181	12.396
A259 east: city centre to Roedean School	5.892	20.106	14.214
A259 west: city centre to Shoreham	23.596	39.919	16.323
Total	53.058	104.856	51.798

Table 5.2: Financial Assessment (present values discounted to 1998)

5.3 ***Guided Bus Option Assessment***

The results of the Guided Bus option are summarised in Table 5.3. The economic appraisal results indicate that the Guided Bus option also produce sufficient benefits to ensure viability. The overall NPV for all corridors in £17mn, which is similar to the LRT results.

Route	PVC	PVB	NPV	BCR
A23: city centre north to A27	17.90	20.81	2.91	1.16
A270: city centre to Falmer	17.90	25.57	7.67	1.43
A259 east: city centre to Roedean School	8.74	9.77	1.03	1.12
A259 west: city centre to Shoreham	35.37	41.29	5.92	1.17
Total	79.91	97.44	17.53	

Table 5.3: Economic Appraisal Results – Guided Bus Base Case (2020 opening year)

In terms of the financial assessment, the system would generate a total operating deficit of £13mn.

5.4 ***Sensitivity Testing***

In order to test the robustness of the above results, sensitivity tests were undertaken assessing the impact on the results of changing key input data.

As discussed previously, the main area of uncertainty in studies of this nature is predicting the likely level of modal transfer following the provision of improved public transport infrastructure. The impact of variations in modal transfer as described in Table 3.3 are summarised in Table 5.4.

Scenario	**Corridor**	**NPV (£mn)**	**Operating surplus (£mn)**
Base scenario	A23	2.37	8.865
	A270	9.78	12.396
	A259 east	0.40	14.214
	A259 west	4.69	16.350
	Total	**17.24**	**51.825**
Low diversion	A23	-2.19	-4.18
	A270	4.32	-2.811
	A259 east	-1.77	1.471
	A259 west	-4.52	-8.35
	Total	**-4.16**	**-13.870**

Table 5.4: Sensitivity test results – LRT option

Under the low diversion scenario, the economic and financial viability of the LRT option in 2020 becomes marginal.

6 The Next Steps

6 The Next Steps

The strategic assessment described in the previous sections clearly demonstrates that there may be a case for significant public transport improvement in the Brighton and Hove area. Given that the city has a population of some quarter of a million inhabitants currently which is set to grow in the next two decades this is not surprising. This is likely to result in an increased demand for travel within the area. However, given the limiting topography and environmental sensitivities in the area, the scope for addressing these increased travel demands by providing additional road capacity alone is limited. Additional public transport infrastructure is therefore key if the Brighton and Hove is to avoid a gradual deterioration in its built and natural environment.

The proposed strategy for future investment in local public transport initiatives indicates a logical stepped increase in provision of additional capacity in Brighton and Hove. The analysis shows the viability of investing in the existing bus network in the next few years, which following traffic growth and increased congestion levels results in the need for additional capacity until the provision of an LRT may be justified by 2020. Furthermore, the analysis indicates that an LRT system could make a significant financial operating surplus. This could be used either for infrastructure debt servicing purposes or utilised for investment in other public transport initiatives.

The strategic assessment is relatively conservative in nature, given the exclusion of any induced traffic benefits. Furthermore, operating and capital investment costs may be lower if the four corridors are considered as one system rather than as four separate corridors. This would result in optimisation of the operating fleet as well as the sharing of fixed overhead costs.

The analysis underlines the need for a more detailed traffic assessment of the Brighton and Hove area including a local transport model. This would more accurately show the likely traffic behaviour in the area following the introduction of public transport improvements as well as showing the effect of increased central area parking charges. Furthermore, a number of proposed junctions improvements on the highway network, including those proposed in the Lewis area could have a significant impact on the volume of traffic currently using the A259.

As mentioned above, the conclusions of the current assessment highlight the need for further study. The Consultant envisages the following steps in the assessment to refine the technical, operational, economic and financial viability including:

- Pre-feasibility study to refine options and routings
- Detailed feasibility study to assess viability of preferred options and determine optimum opening year
- Detailed system design
- Implementation planning including further refinement of project timetables
- Procurement strategy development and planning
- Construction phase
- Operation