

# WEST OF ENGLAND PARTNERSHIP: BUS RAPID TRANSIT

## Corridor Options Short List Report

May 2007



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## REPORT SUMMARY

### Introduction

1. At the end of 2006 the final Public Transport Corridor Options<sup>1</sup> report identified four Bus Rapid Transit (BRT) options that performed the best against the criteria assessed. These were:
  - Ashton Vale to Bristol City Centre.
  - Hengrove/Hartcliffe to Bristol City Centre.
  - North Fringe to Bristol City Centre.
  - Emerson's Green to Bristol City Centre.
2. A selection of one of these options, or a combination of these options, now needs to be made for further scheme development work to be undertaken and a major scheme submission in Summer 2008.
3. The purpose of this further work has therefore been to allow for a decision to be made at the end of March 2007 on a preferred option(s). This report sets out the review of the four short-listed BRT route options which has been undertaken in the following five areas:
  - Operational Specification.
  - Design/Engineering.
  - Bristol City Centre Routes and Stopping Pattern.
  - Impact Assessment.
  - Demand Assessment.

### Further Issues Identified in this Further Work

4. A number of further issues has been identified in this stage of more detailed work. These include:
  - Ashton Vale – the representations to the Examination in Public of the Regional Spatial Strategy made by the developer of the proposed Ashton Park development show a BRT link through to the northern part of the development (near the Long Ashton Park and Ride) and a link to the southern part of the development (south of the railway line). The southern part of the development contains the majority of the proposed development (7,500 houses out of 10,000) and therefore this second link will be important in terms of patronage. The BRT crossing of the mainline railway needs to be considered in conjunction with other transport proposals for the development and the layout of the development itself.
  - Emerson's Green – the Temple Quay North development, currently under construction north of Temple Meads has retained an alignment between the residential buildings. However, whilst the width of the alignment has been literally retained, the front doors of the residential properties directly open on to

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<sup>1</sup> Greater Bristol Public Transport Corridor Options, Final Report, Steer Davies Gleave, January 2007

this alignment. Therefore, further options for linking in to Bristol City Centre have been identified. Some of these options would not directly serve Temple Meads Rail Station.

- Hengrove/Hartcliffe – the “pinch-point” review identified a number of opportunities to de-scope the works on this route, i.e., removing significant infrastructure works in favour of short-sections of bi-directional running. Given the lower levels of patronage forecast on this route this is an option that could be considered further.
- North Fringe – the work looking at Bristol City Centre has identified further pinch-points and additional city centre traffic constraint measures may be needed to link to the North Fringe route.
- North Fringe – a lower cost route to Bradley Stoke has been identified as an option as well as an option to terminate at Bristol Parkway Rail Station. Both of these need to be tested against the route identified at the long-list stage.

## Assessment Summary

### Corridors

5. Each route would have a core BRT service at a 10 minute frequency in the peak hour with higher frequencies where they replace current Park and Ride services or potentially where they would serve future Park and Ride sites.
6. In addition, current bus services that would benefit from using the BRT infrastructure have been identified. Service patterns for all four BRT routes have been identified which would maintain ordinary bus service levels in the corridors where BRT services would run. This would retain the benefits in relation to the GBBN improvements. The area in this work where proposals are still not complementary is the proposed infrastructure works on the M32 for the North Fringe route.
7. All pinch-points identified can be addressed, although with differing levels of mitigation.
8. All four routes have environmental, planning and land impacts. These vary in type and severity by route. The environmental impacts will require a full assessment, sensitive treatment and appropriate mitigation. Land impacts are relatively small for schemes of this size. Emerson’s Green and Hengrove/Hartcliffe are mainly within ownership of one of the Authorities and the North Fringe route uses significant amount of public highway and verge. Protection of the routes through the relevant Local Plans is not comprehensive and the planning position of the all four alignments will need further review.
9. The catchment analysis suggests that all implementation of all four routes would put around 85,000 persons within a 10 minute walk from a BRT stop. It broadly supports the demand work undertaken at the Long-List stage.
10. The results of the corridor assessment are summarised in the table below.

Corridor Assessment Summary Table

Route	Operational Specification		Design/Engineering	Impacts		Demand Assessment
	Fit with Existing Services	Fit with GBBN	Pinch-Points	Planning / Environment	Land Ownership	Catchment Analysis
Ashton Vale	Service levels on Hotwells Rd reduced.	Yes	<ul style="list-style-type: none"> <li>Portishead Freight Line</li> <li>Prince St Bridge</li> <li>Link to Ashton Park West</li> </ul>	<p>Most of the route safeguarded by Local Policy.</p> <p>Some flood risk, Green Belt and ground contamination issues.</p>	Around a third UA owned	12,000 within 10 min walk (excluding new development)
Emerson's Green	Service levels on A432 retained.	Yes	<ul style="list-style-type: none"> <li>Route in to Bristol City Centre from Lawrence Hill</li> <li>Clay Bottom</li> <li>Tunnel at Staple Hill</li> </ul>	<p>Most of the route safeguarded by Local Policy.</p> <p>Designated in the Bristol Local Plan as a Greenway, Open Space and a Site of Nature Conservation Interest.</p> <p>Some noise, amenity and biodiversity issues.</p>	Mostly owned by UAs.	33,000 within 10 min walk (excluding new development)
Hengrove /Hartcliffe	Service levels in corridor retained.	Yes	<ul style="list-style-type: none"> <li>New River Avon bridge</li> <li>East Street</li> <li>Railway crossing</li> <li>Link to Whitchurch</li> </ul>	<p>Some of the route safeguarded in the Bedminster and Hengrove areas.</p> <p>Flood risk, culverting waterways, and biodiversity issues.</p> <p>Hengrove Park is SSSI, SNCIs adjacent to Hartcliffe Way and north of the Fire Station</p>	Most of the route UA owned or on public highway.	22,000 within 10 min walk (excluding new development)
North Fringe	Service levels in corridor retained.	M32 section complementary.	<ul style="list-style-type: none"> <li>M32 junctions</li> <li>Railway crossing to Parkway</li> <li>Railway crossings to Cribbs Causeway</li> <li>Additional junction on M32</li> </ul>	<p>Some of the route safeguarded.</p> <p>Culverting River Frome and biodiversity issues.</p>	Most of the route on public highway	10,000 to 18,000 within 10 min walk (excluding new development)

### **Bristol City Centre**

11. Assessment of the city centre alignments has concentrated on using and extending existing bus priorities, whilst minimising the impact on general traffic where possible. The design work undertaken to support the Supertram alignment in the city centre has also been utilised where possible. This has resulted in orbital route options linking Temple Meads Rail Station, The Centre and Broadmead via Broad Quay, Rupert Street/Nelson Street and The Horsefair.
12. Overall, the routes proposed generally build on existing bus priorities and are not considered to require significant reductions in capacity for general traffic.
13. Discussions with officers within Bristol City Council's traffic signal team have confirmed the viability in principle of the bus priority proposals, subject to detailed design and modelling at a later stage.
14. Two joint officer workshops were held in February and March with representatives from First to consider how the BRT routes could complement bus route aspirations in the city centre. These meetings have progressed an ongoing bus service review to simplify bus routing patterns and concentrate on an orbital route structure through the city centre for bus operations, capitalising on route options for BRT.
15. The North Fringe route is more complicated to accommodate than those from Emerson's Green, Ashton Vale and South Bristol and is more likely to bring forward further general traffic restrictions. For this reason it may be less well suited to early consideration as part of the route prioritisation process.
16. The overall objective this area of work has been to ensure that viable city centre alignments can be implemented for BRT, subject to detailed design and further assessment of impact on traffic capacity. By reliance on existing and future bus priority measures, together with the use where applicable of the existing protected alignment for the Supertram, route options can be accommodated which will enable reliable service operation whilst keeping the diversionary impact on general traffic to a minimum

### **Conclusions**

17. The Ashton Vale to Bristol City Centre route has a level of reliance on the development at Ashton Park. This development has not yet been allocated in the final Regional Spatial Strategy. The Examination in Public for this will be completed by Summer 2007.
18. The Emerson's Green to Bristol City Centre route has some clear benefits in terms of the area it serves, high potential patronage and mode shift from the private car, its connection with new development and its completeness or sustainability as a potential BRT corridor.
19. The Hengrove/Hartcliffe to Bristol City Centre route is the least strong of the options in terms of potential benefits, however, there are opportunities to de-scope the works and reduce the capital cost. This could improve the economic case for the route.



20. The North Fringe route, whilst having some clear benefits, has a number of deliverability issues. The high cost of the route to Cribbs Causeway identified at the long-list stage can be overcome by taking a route through to Bradley Stoke. This would still not complement the GBBN Corridor 1 proposals for the M32. Making use of the M32 GBBN improvements and providing a BRT link north of the M32 is an option that would overcome this, but this does not provide a complete BRT corridor for the first route of a BRT network in terms of public perception and provision of an alternative mode.

### Recommendations and Next Steps

21. Therefore it is recommended that:
- The Emerson's Green to Bristol City Centre route with an extension to Long Ashton Park and Ride, including the on-street works in Bristol City Centre, is pursued at this stage as the next RFA BRT route. This requires:
    - A full costing of the route.
    - Development of a procurement strategy including a full review of policy and planning requirements.
    - An environmental scoping exercise to be completed as soon as possible. Environmental surveys commence Summer 2007.
    - A full communications strategy including key stakeholder discussions commencing Summer 2007.
  - If the proposed Ashton Park development is confirmed in the final Regional Spatial Strategy then the route connecting the development can be taken forward as a further section of the BRT network in the RFA programme and should be worked up in conjunction with other transport proposals for the new development and, potentially linked with Bristol International Airport.
  - The other routes are worked up for potential inclusion in the TIF package (scheme submission December 2007), amongst others, such as the route to Bath for example. Options for the further routes to be assessed should include:
    - Hengrove/Hartcliffe:
      - Fully segregated route.
      - <100% segregated route, e.g. small sections of bi-directional running.
    - North Fringe:
      - M32 to Bristol Parkway.
      - Bradley Stoke to Bristol Parkway.
      - Cribbs Causeway to Bristol Parkway via Filton.
      - Cribbs Causeway to Bristol Parkway via Bradley Stoke.

- All four routes are worked up in consideration of the BRT Line 1 in Bath so an integrated BRT network is developed.
- A final decision on the RFA scheme be taken at the time of the TIF submission should a TIF scheme be put forward to DfT. In the event that a TIF scheme is not submitted, sufficient work will have been undertaken on all four routes to allow for a review of the RFA programme at that stage.

## 1. INTRODUCTION

### Introduction

- 1.1 At the end of 2006 the Public Transport Corridor Options final report<sup>2</sup> identified four Bus Rapid Transit (BRT) options that performed the best against the criteria assessed. These were:
- Ashton Vale to Bristol City Centre.
  - Hengrove/Hartcliffe to Bristol City Centre.
  - North Fringe to Bristol City Centre.
  - Emerson's Green to Bristol City Centre.
- 1.2 A selection of one of these options, or a combination of these options, now needs to be made for further scheme development work to be undertaken and a major scheme submission in Summer 2008.
- 1.3 The purpose of the work was therefore to allow for a decision to be made at the end of March 2007 on a preferred option(s). This report sets out the review of the four short-listed BRT route options which has been undertaken in the following five areas:
- Operational Specification.
  - Design/Engineering.
  - Bristol City Centre Routes and Stopping Pattern.
  - Impact Assessment.
  - Demand Assessment.
- 1.4 These alignments are shown in Figure 1.1.
- 1.5 Further consideration was also given to the conclusions of the GBSTS/RFA priority list to ensure consistency in the overall prioritisation of options taking account of all externalities.

### Focus of the Work

#### *Operational Specification*

- 1.6 The operational specification work has identified outline timetables for each route which have then been used to look at accessibility issues through Accession mapping. Service patterns have taken in to consideration the fit with existing bus services and looked at potential changes to these to ensure BRT services and bus services would together provide a complementary public transport offer in the particular corridors. A review of the location of stops has also been undertaken to maximise the potential catchment area.

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<sup>2</sup> Greater Bristol Public Transport Corridor Options, Final Report, Steer Davies Gleave, January 2007

### ***Design/Engineering***

- 1.7 The design/engineering work has focussed on “pinch-points”. The initial specification for the BRT alignment is for a two-lane, 100% segregated busway along the entire corridor. The term “pinch-point” refers to those areas along the alignment where the identified corridor does not have sufficient width to fit the two-lane busway. In some places this includes the consideration of also fitting a cyclist and pedestrian facility within the corridor. The impacts of insufficient width could include land and property acquisition, additional infrastructure works (particularly where that part of the corridor is a bridge or is within a cutting) and re-allocation of existing road-space or parking. The number of pinch-points and their severity is an important consideration in selection of a preferred route in terms of costs and risk.

### ***Bristol City Centre Routes and Stopping Pattern***

- 1.8 Further consideration of possible Bristol City Centre alignments has the aim of further clarifying how to reconcile the objective of maximising segregation for BRT vehicles with the central area’s wider requirements, in particular regarding a wider review of bus stopping and routing options. The objectives of this area of work have therefore been to consider, and consult with city council officers, at an outline stage, potential amendments to route options with regard to:

- Interaction with existing bus stopping and service patterns.
- Impact on, and accommodation of, general traffic movements.
- City centre loading and servicing requirements.

### ***Impact Assessment***

- 1.9 The impact assessment identifies key areas of sensitivity such as land acquisition and environmental impact as well as understanding the relationship with other projects and current developments.

### ***Demand Assessment***

- 1.10 The purpose of further demand assessment work at this stage is to provide a check on the modelling results reported to date and to provide information into the operational specification and design/engineering review work to ensure development and assessment of the scheme is demand led.
- 1.11 As has been reported, the modelling framework available to the project for assessing BRT in the sub-region is currently being updated. In the interim, to support the aim of checking the modelling results, and having a demand-led design approach existing data sources has been used to undertake some catchment analysis on census data using GIS and Accession mapping.



## 2. ASHTON VALE TO BRISTOL CITY CENTRE

2.1 The Ashton Vale corridor is a fully segregated two-lane busway running from Prince Street at a point immediately to the south of the existing Bristol Industrial Museum building, connecting with the alignment of the Bristol Harbour Railway line running along the south side of the Floating Harbour adjacent Cumberland Road, crossing the River Avon on the existing Ashton Avenue Bridge and then connecting through to the Long Ashton Park and Ride site via an alignment through the proposed Ashton Park development. The existing pedestrian and cyclist facilities using some sections of the disused railway line would be retained.

### *Description of the Route*

- 2.2 After crossing the Floating Harbour over Prince Street Bridge, the alignment branches west at a busway-only junction to run as a two-lane busway along the southern edge of the current Bristol Industrial Museum building through the planned Wapping Wharf development. It then takes up the alignment of the Harbour Extension of the Bristol Harbour Railway, which would be removed.
- 2.3 Passing under Cumberland Road at the existing skew bridge, it then runs along the railway alignment on the north bank of the River Avon on the southern side of Cumberland Road.
- 2.4 At the end of the Floating Harbour, the busway crosses the River Avon on the disused railway bridge (Ashton Avenue Bridge) and continues on the railway alignment passing under Brunel Way twice before converging with the Portishead Freight Line at Ashton Junction Level Crossing (Ashton Vale Road). The level crossing and the adjacent signal-controlled road junction would be reconfigured to accommodate the busway.
- 2.5 From this point, the alignment would need to pass through developed industrial areas to reach the Long Ashton Park & Ride site. There are a number of options for linking in to the Park & Ride site and these depend on the boundary and land availability of the new development and its access plans.
- 2.6 Finally, the alignment could continue beyond the Park & Ride site to serve the proposed new Ashton Park development in the area between the A370 and A38 with a potential extension to Bristol International Airport. A segregated corridor could be provided in the masterplan for the development.
- 2.7 The Ashton Vale to Bristol City Centre alignment is shown in Figure 2.1.

## Operational Specification

### ***BRT Services***

- 2.8 BRT services on this corridor will operate a 5 minute frequency at peak times and a 10 minute frequency off-peak between Long Ashton Park and Ride and Bristol City Centre. Services could extend in to the new Ashton Park development.

### ***Changes to Bus Services***

- 2.9 It is likely that BRT operation would replace the current 903 park & ride service which currently provides a similar service to the proposed BRT route.
- 2.10 To improve journey times and reliability the North Somerset inter-urban routes which operate through Long Ashton village or via the Long Ashton by-pass could use the BRT corridor between the Long Ashton Park & ride site and Bristol City Centre. These services are shown in Table 2.1

**TABLE 2.1 EXISTING BUS SERVICES POTENTIALLY USING BRT INFRASTRUCTURE ON THE ASHTON VALE TO BRISTOL CITY CENTRE CORRIDOR**

Service	Service Description	Buses per hour
X1	Bristol – Weston-super-Mare	2 *
350/1/3	Bristol – Weston-super-Mare	1 *
X7	Bristol – Clevedon	1 *
355/362/364	Bristol – Clevedon	1 *
354	Bristol – Nailsea	2 *

\* Monday to Saturday daytime frequency

- 2.11 A combination of the BRT service and the North Somerset inter-urban services could provide a service level on the busway of 13 buses per hour in the inter-peak on Mondays to Saturdays, between the Long Ashton Park and Ride site and Bristol City Centre.
- 2.12 On Monday to Saturday between peaks Hotwells Road is currently served by 12 buses per hour, mainly inter-urban routes to/from North Somerset. Diverting the North Somerset inter-urban services on to the BRT route would remove 5 buses per hour from Hotwells Road. However, the Avonmouth park & ride service (902) can be revised to stop at the three pairs of stops between Hotwells and the city centre, increasing the number of buses on this corridor to 9, which should be adequate to meet demand. Services on Hotwells Road would consist of:
- the Avonmouth Park & Ride service 902, which operates a 15 minute frequency Monday to Saturday daytimes;
  - Bristol to Portishead services 358 and 359 every 30 minutes; and
  - service 500, which operates to Hotwells via Park Street, Jacobs Wells Road and Hotwells Road every 20 minutes.

2.13 A further service option is for the Bristol to Portishead service to join the BRT route near the junction of Clanage Road and Brunel Way. This would require a new crossing of the Portishead freight line (in addition to the crossing further south). The business case for this additional crossing would need to be established before considering this service change.

2.14 The potential services for this corridor are shown in Figure 2.2.

### **Stops**

2.15 Stops on this route could be provided at:

- The new Wapping Wharf development.
- Cumberland Road (adjacent to the existing Vauxhall Bridge).
- Ashton Gate.
- Ashton Park East.
- Long Ashton Park & Ride.
- Ashton Park West.

### **Design/Engineering**

2.16 There are a number of potential pinch-points along the route that have been identified. These pinch-points and recommended solution are:

- Prince Street Bridge (swing bridge) – insufficient width for a two-lane busway and pedestrian and cycle path. Suggested solution is reconstruction of the bridge taking in to consideration its listed status and need for ongoing use.
- Alignment in to and through the new Wapping Wharf development – ensure the developers of the site reserve sufficient width for the BRT alignment, BRT-only junction with Wapping Road and stop within the new development.
- Alignment from the Wapping Wharf development to Cumberland Road Underpass and the Cumberland Road Underpass – insufficient width for a two-lane busway and pedestrian and cycle path. Suggested solution is bi-directional running underneath Cumberland Road with signals for BRT vehicles.
- Cumberland Road – insufficient width for a two-lane busway and pedestrian and cycle path. Suggested solution is realignment of Cumberland Road, removal of on-street parking and relocation of Coach parking.
- Vauxhall Bridge – the bridge’s supporting structure directly conflicts with the location of the busway running surface. Suggested solution is reconstruction of the Vauxhall Bridge to incorporate new stop and pedestrian access improvements.
- Ashton Avenue Bridge – insufficient width for a two-lane busway and pedestrian and cycle path. Suggested solution is bridge works to extend or cantilever a pedestrian/cycle bridge.
- Running alongside the Portishead Freight Line – potentially insufficient width for a two-lane busway and pedestrian and cycle path. Further work and consultation with Network Rail is required.
- Type and Location of the Portishead Freight Line Crossing – a number of solutions are possible. Further work and consultation with Network Rail is required.



## Impact Assessment

### *Planning*

- 2.17 Most of the route has a safeguarded status within the 2003 Proposed Alterations to the Bristol Local Plan. Current planning applications and permissions along the route include:
- Wapping Wharf - given consent June 2006. This development covers the site south of the museum and includes approximately 600 new dwellings. The application retains a protected alignment through the site for LRT which is proposed to be utilised by the BRT route.
  - The southern end of the route impacts on current masterplan proposals for substantial housing development in the Ashton Vale area, and may facilitate a future extension to Bristol International Airport at a later date. Consultants supporting the scheme have produced an Access and Movement Framework which emphasises the potential role to be played by BRT and how the development could assist in facilitating the route.

### *Environment*

- 2.18 The sections of the proposed route between Ashton Vale and Winterstoke Road, including Colliters Brook, may be liable to flood risk. In addition, part of the route is identified as 'Green belt and Wildlife Network' within the proposed alterations to the Local Plan. This will require a detailed Biodiversity Impact Assessment to be undertaken.
- 2.19 The alignment through Ashton Park is likely to pass over a former tipping site so potential land contamination from tipping may affect ground conditions.
- 2.20 The route largely falls within Bristol City Council's Air Quality Management Area which will impact on the specification of vehicles and their emissions.

### *Land*

- 2.21 Significant proportions of the rail alignment between Wapping Wharf and Cumberland Basin are already within local authority ownership. These sections are shown in Table 2.2. Other sections of route remain in Network Rail ownership.

**TABLE 2.2 LOCAL AUTHORITY LAND OWNERSHIP: ASHTON VALE CORRIDOR**

Corridor Section	Description
Alignment through Wapping Wharf	Bristol Industrial Museum site
Railway path alongside Cumberland Road	From south of the Cumberland Road underpass up to where Cumberland Road turns north to Avon Crescent.
Ashton Avenue Bridge	Bridge structure and short stretch south of the bridge.

**Demand Assessment**

- 2.22 Catchment analysis shows that there are around 12,000 persons in the Ashton Vale to Bristol City Centre corridor that would be within a 10 minute walk of a BRT stop (Table 2.3). Of these persons, 30% live in a household without regular access to a car.

**TABLE 2.3 ASHTON VALE TO BRISTOL CITY CENTRE CORRIDOR: CATCHMENT ANALYSIS**

BRT Stop	Number households within 10 minute walk from BRT Stop <sup>1</sup>	Number Persons within 10 minute walk from BRT Stop <sup>1</sup>	% Households without Car <sup>1</sup>
Wapping Wharf	965	2,169	39%
Cumberland Road	2,326	5,167	29%
Ashton Gate	967	2,232	28%
Ashton Vale East	442	1,012	28%
Long Ashton P&R	232	523	26%
Ashton Vale West	262	618	20%
<b>Total</b>	<b>5,194</b>	<b>11,720</b>	<b>30%</b>

Notes:

1 – Source: 2001 Census data.

- 2.23 The proposed development at Ashton Park is for an additional 10,000 households which could result in a further 22,500 people living in Ashton Park (assuming a similar percentage of persons per household as currently in Ashton Vale West). The proximity of these persons to BRT stops will depend on the final location and integration of BRT within the Ashton Park development.





### 3. EMERSON'S GREEN TO BRISTOL CITY CENTRE

- 3.1 The Emerson's Green corridor is a fully segregated two-lane busway along the Bristol to Bath Railway Path to Emerson's Green South and then continuing alongside the A4174 Avon Ring Road to the new Emerson's Green development. The existing pedestrian and cyclist facilities would be retained.

#### *Description of the Route*

- 3.2 From Bristol City Centre there are a number of possible routes to access the start of the current railway path at Easton. These are:
- via Temple Meads – through the development at Temple Quay joining the railway path at Barton Road.
  - via Unity Street/Old Market – running outbound via Unity Street and Waterloo Road and running inbound via Midland Road and Old Market (making use of the planned bus lanes on Old Market) joining the railway path at Trinity Street.
  - via Lawrence Hill – running via Old Market/West Street/Clarence Road/Lawrence Hill joining the railway path at the junction of Lawrence Hill and Croydon Street.

The first route would directly serve Temple Meads Rail Station, the latter two would result in services running straight in to and from Bristol City Centre.

- 3.3 From Easton the alignment continues along the Bristol to Bath Railway Path. At Fishponds, between New Station Road and Forest Road the alignment widens and is at-grade with the surrounding road network. This section provides an opportunity to provide a bus interchange with regular, stopping services using Fishponds Road (A432) and for BRT services to join and leave the busway.
- 3.4 The alignment continues along the Bristol to Bath Railway Path where, at Station Road (A4175), again the alignment potentially offers an opportunity to include a bus interchange and joining/leaving point for BRT services. This section is within a cutting, albeit relatively wide, and further work on the potential slips and gradients would need to be undertaken to see if an interchange point was possible. This section is close to the Mangotsfield Road (B4465) and Station Road (A4175) itself then links to the Avon Ring Road (A4174).
- 3.5 The alignment continues along the Bristol to Bath Railway Path and turns north east where the cycle path diverges in to a north east route and south east route to Bath and then joins the Avon Ring Road (A4174). The exact route to the proposed Emerson's Green development will depend on the layout of the development and location of the proposed park and ride site. The alignment could use a new bridge over the A4174 Avon Ring Road or access the new development from the Rosary Roundabout.
- 3.6 The Emerson's Green to Bristol City Centre alignment is shown in Figure 3.1.

## Operational Specification

### ***BRT Services***

- 3.7 BRT services on this corridor would operate a 10 minute daytime frequency and a 30 minute evening, Sunday and Bank Holiday frequency. If the service is operated in conjunction with a new park & ride site at Emerson's Green, the Monday to Saturday peak hour frequency would need to be enhanced to every 5 minutes.

### ***Changes to Bus Services***

- 3.8 It is proposed that services X40 and X42, the limited stop services between Chipping Sodbury, Yate and Bristol would use the BRT corridor between the ring road at Emersons Green and Central Bristol. New limited stop services X48 and X49 (Emersons Green to City Centre) would be introduced under the Greater Bristol Bus Network major scheme bid and the Yate, Pucklechurch, Bristol service 689, would use the BRT route between Staple Hill East and Central Bristol. Service 342, Chipping Sodbury, Yate – Central Bristol will utilise the BRT corridor between Fishponds, Morrison's store and Central Bristol. Service 6 Kingswood – City Centre and Service 7 Staple Hill – City Centre would use the BRT route to improve their reliability and shorten their running times between Easton, Russell Town Avenue and Central Bristol. These services are shown in Table 3.1.

**TABLE 3.1 EXISTING BUS SERVICES POTENTIALLY USING BRT INFRASTRUCTURE ON THE EMERSON'S GREEN ROUTE**

Service	Service Description	Buses per hour
X40/X42	Bristol – Yate/Chipping Sodbury	2*
X48/X49	Emerson's Green – Central Bristol	4*
689	Bristol – Pucklechurch - Yate	1*
342	Bristol – Yate/Chipping Sodbury	1*
6	Kingswood – Central Bristol	4*
7	Staple Hill – Central Bristol	4*

\* Monday to Saturday daytime frequency

- 3.9 On Mondays to Saturdays inter-peak a combination of the BRT service and the local bus services (above) could provide a service level on the busway of 8 buses per hour between the Emersons Green and Bristol City Centre and 12 buses per hour between Staple Hill East and the Central Bristol.
- 3.10 Under these proposals the Monday to Saturday daytime frequency on Services 48 and 49 would be maintained at every 15 minutes on each route between Downend/Staple Hill and the City Centre, with two journeys an hour continuing to Emersons Green. New limited stop services X48 and X49 are to be introduced under the Greater Bristol Bus Network major scheme bid; these can utilise the BRT route to provide a faster, more reliable service between Emersons Green, Mangotsfield and Central Bristol.
- 3.11 The potential service diagram is shown in Figure 3.2.

### **Stops**

3.12 Stops on this route could be provided at:

- Temple Meads / Old Market.
- Lawrence Hill.
- Devon Road.
- Ridgeway Road.
- Fishponds.
- Staple Hill.
- Staple Hill East.
- Emerson's Green South (Sainsburys).
- Emerson's Green Park and Ride.
- Emerson's Green North.

### **Design/Engineering**

3.13 There are a number of potential pinch-points along the route that have been identified. These pinch-points and recommended solution are:

- Retaining Cycle Path (generally) - The width along the entire length of the railway path varies along the corridor. Whilst in most locations the alignment appears to be of a sufficient width to provide for a two lane busway and pedestrian and cycle path, there may be points along the route where this is not the case. Obvious exceptions are where the alignment has been encroached upon or built near are identified below. Some measurements have been taken intermittently along the alignment and reviews of Ordnance Survey (OS) plans suggest that there is the required space, however it is impossible to be 100% certain without a full topographical survey (OS mapping and site surveys identify specific areas as listed below but OS mapping can be incorrect).
- Route from City Centre to Easton – the section of railway path between Bristol City Centre and Easton has insufficient width and is incomplete. The main factors impinging on the alignment are: the development at Temple Quay North; the Waste Transfer Station and associated railway sidings; and the Kingsland Trading Estate. Taking the most direct route through to Temple Meads conflicts with all three of these pinch-points. Options exist to leave the railway path at Lawrence Hill or New Town which would avoid these, however, these two routes would mean that the corridor does not serve Temple Meads Rail Station directly (services could run on-street via Temple Way).
- Residential Properties at Clay Bottom – there is insufficient width available between the backs of properties on Rose Green Road, the sides of properties on Clay Bottom and across the bridge over Rose Green/Gordon Road for a two-lane busway and pedestrian/cycle path. The suggested solution is to provide a separate pedestrian and cycle bridge adjoining the existing bridge and linking with the existing cycle path along Rose Green Road. This would be likely to require property acquisition of a couple of properties on Rose Green Road. The properties along Clay Bottom would be close to the busway and there will be some noise and visual intrusion.
- Lodge Causeway – there is insufficient width available underneath Lodge Causeway for a two-lane busway and pedestrian/cycle path. The suggested

solution is to construct an additional span underneath Lodge Causeway. This is may require property acquisition.

- Tunnel at Staple Hill – there is insufficient width available through the tunnel between Acacia Road and Seymour Road to fit a two-lane busway and pedestrian and cycle path. There is limited opportunity to provide an alternative direct pedestrian and cycle path through this area as there is no direct on-street link. The suggested solution is bi-directional running through the tunnel with signals, which can be accommodated within the proposed service specification.

## **Impact Assessment**

### ***Planning***

- 3.14 The Emersons Green alignment is protected under the 2003 Proposed Alterations to the Bristol Local Plan between Lawrence Hill and Staple Hill. The South Gloucestershire Local Plan Alterations protects the Bristol/Bath corridor only "pending the evaluation of other routes to serve Yate and East Bristol".
- 3.15 The proposed park and ride site forms a key part of the Emerson's Green Area C development masterplan (see below) and is identified in the text (although not on the proposals map) of the South Gloucestershire Local Plan as "a multi-modal Interchange site within the Emersons Green development, to be implemented by 2007/08". The proposed park and ride site is not in Green Belt.
- 3.16 Current related planning applications and permissions include:
- Temple Quay North development - is partially complete with further detailed applications still being submitted. There is a need to achieve a protected reservation between the building blocks to maintain a direct route for BRT.
  - Residential development by Dunkirk Road, adjacent to the Lodge Causeway over-bridge - has been granted on appeal at a site alongside the cycle path. This has compromised the LRT reservation at this point and will necessitate alteration to, or replacement of, the bridge for two-way BRT to be accommodated as well as a segregated cycle/walkway.
  - Emersons Green Area C - is the subject of a masterplan and outline planning application for up to 3,000 dwellings and 6,000 jobs. A determination of the outline application is likely in December 2007, and discussions to determine the BRT reservation with the developer will be required urgently.

### ***Environment***

- 3.17 The Bristol to Bath corridor is also designated in the Bristol Local Plan as a Greenway, Open Space and a Site of Nature Conservation Interest and as such the status of the route as a wildlife corridor will require sensitive mitigation and a detailed Biodiversity Impact Assessment as part of the detailed design of the scheme.
- 3.18 Bristol City Council's Air Quality Management Area includes Easton and the specification of BRT vehicles will need to take account of this.

### ***Land***

- 3.19 The majority of the cycle path route is within Council ownership with the exception of



a small number of isolated sections.

### Demand Assessment

- 3.20 Catchment analysis shows that there are around 33,000 persons in the Emerson's Green to Bristol City Centre corridor that would be within a 10 minute walk of a BRT stop (Table 3.2). Of these persons, 30% live in a household without regular access to a car.

**TABLE 3.2 EMERSON'S GREEN TO BRISTOL CITY CENTRE CORRIDOR: CATCHMENT ANALYSIS**

BRT Stop	Number households within 10 minute walk from BRT Stop <sup>1</sup>	Number Persons within 10 minute walk from BRT Stop <sup>1</sup>	% Households without Car <sup>1</sup>
Lawrence Hill	1,946	3,833	55%
Devon Road	3,306	7,309	34%
Ridgeway Road	1,507	3,379	26%
Fishponds	1,573	3,824	27%
Staple Hill	3,028	7,091	28%
Staple Hill West	2,401	5,910	18%
Emerson's Green South	678	1,615	3%
Emerson's Green North	130	315	4%
<b>Total</b>	<b>14,569</b>	<b>33,277</b>	<b>30%</b>

Notes:

1 – Source: 2001 Census data.

- 3.21 The proposed development at Emersons' Green is for an additional 3,000 households which could result in a further 7,300 people living in Emersons' Green (assuming a similar percentage of persons per household as currently in Emerson's Green). The proximity of these persons to BRT stops will depend on the final location and integration of BRT within the Emersons' Green development.





#### 4. HENGROVE/HARTCLIFFE TO BRISTOL CITY CENTRE

- 4.1 The Hengrove/Hartcliffe to City Centre via Malago Green Way corridor is a fully segregated two-lane busway running from Prince Street across a new bridge over the River Avon connecting to St Johns Road and Dalby Avenue up to the existing mainline railway and then continuing along the alignment of the Malago Greenway to Hengrove and Hartcliffe. The route could be extended to Whitchurch by connecting through to Knightsbridge Drive and around the back of the existing housing at Whitchurch to serve a potential new development and proposed Park and Ride site. The aim is to retain the existing cyclist and pedestrian facilities along this corridor.

##### *Description of the Route*

- 4.2 This corridor crosses the River Avon by a new busway bridge connecting Coronation Way to Wapping Road at the junction of Cumberland Road and Bathurst Road (this would also provide access for cyclists and pedestrians).
- 4.3 South of the Avon crossing, the alignment runs along St John's Road and then Lombard Street to cross East Street in the main retail area of Bedminster. The alignment continues south parallel to Dalby Avenue before crossing a small triangular green on Providence Place to pass under the main Bristol-Taunton railway.
- 4.4 After passing under the railway, the alignment follows the Malago stream, which may need to be culvertered and/or diverted in places. It skirts the back gardens of houses in Cotswold Road and then passes immediately north of St John's Burial Ground using the Malago Vale Estate access road. The route crosses the triangle formed by St John's Lane, Bedminster Road and Francis Road which is a complex area and there are a number of at-grade possible solutions.
- 4.5 Continuing south, the alignment runs along the Malago corridor, crossing Marksbury Road and Lynton Road at-grade. Small amounts of property may be required in constrained locations (e.g. at Marksbury Road) and sections of the Malago stream may need to be diverted.
- 4.6 Hartcliffe Way is single carriageway but there appears to be sufficient land available for widening to accommodate a busway. At the northern end this would require some property acquisition – again this is mainly parking and landscaping at present. The alignment would cross the access in to the Bedminster Fire Station.
- 4.7 South of Bedminster Fire Station, where the Malago runs alongside the road briefly, the alignment runs in space on the east side of Hartcliffe Way as a segregated busway. Some realignment of the road will probably be required to accommodate the busway while avoiding the small valley of the Pigeonhouse Stream that runs parallel to the road for part of the distance. The alignment then crosses Hengrove Way in an underpass east of the roundabout to enter the Hengrove Park development area.
- 4.8 If the route continues to Whitchurch an alignment could be achieved by connecting to Knightsbridge Drive where there is sufficient space running past the end of Longway Avenue and Hennessy Close. The alignment would then run along the back of existing housing at Whitchurch through, or skirting, the proposed development and joining the

proposed park and ride site.

4.9 The Hengrove/Hartcliffe to Bristol City Centre alignment is shown in Figure 4.1.

**Operational Specification**

***BRT Services***

4.10 BRT services on this corridor would operate a 10 minute frequency daytimes and a 30 minute frequency during the evenings and on Sundays and Bank Holidays, with a peak vehicle requirement of 7. If a new park & ride site is constructed at Whitchurch the Monday to Saturday peak hour frequency would need to be enhanced to every 5 minutes, increasing the PVR proportionately.

***Changes to Bus Services***

4.11 It is proposed that new service 379, a direct service between Midsomer Norton and Bristol, to be introduced under the Greater Bristol Bus Network major scheme bid, would use the BRT corridor between Whitchurch and Central Bristol. A new limited stop service between Hartcliffe and Central Bristol, numbered X75, will operate via the BRT route between Hengrove Park and Central Bristol. Services 89 and 90, Knowle West – Central Bristol will utilise the BRT corridor between Malago Vale and Central Bristol and Services 24/25 Ashton Vale – Lockleaze and Service 52 Hengrove – Knowle would use the BRT route to improve their reliability and shorten their running times between Bedminster, East Street and Central Bristol. These services are shown in Table 4.1.

**TABLE 4.1 EXISTING BUS SERVICES POTENTIALLY USING BRT INFRASTRUCTURE**

Service	Service Description	Buses per hour
379	Bristol – Midsomer Norton	1*
X75	Hartcliffe – Central Bristol	3*
89/90	Knowle West – Central Bristol	6*
24/25	Ashton Vale - Lockleaze	6*
52	Hengrove - Knowle	4*

4.12 During the inter-peak, Monday to Saturday a combination of the BRT service and the local bus services (above) could provide a service level on the busway of 10 buses per hour between Hengrove Park and Bristol City Centre and 16 buses per hour between Malago Vale and Central Bristol.

4.13 The potential service diagram is shown in Figure 4.2.

***Stops***

4.14 Stops on this option could be provided at:

- Bedminster (East Street) – serving the town centre.

- Bedminster Rail Station.
- Malago Vale (south of St Johns Lane).
- Headley Lane (on Hartcliffe Way).
- Nover's Lane (on Hartcliffe Way)
- Hengrove Park.
- Rookery Farm.
- Whitchurch Park and Ride.

### **Design/Engineering**

#### ***Pinch-points***

4.15 There are a number of potential pinch-points along the route that have been identified. These are:

- St John's Road/ Asda car park – there is insufficient width for two-lane busway and car traffic. Suggested solution is realignment of St John's Road which would require small land acquisition of Asda car park.
- Junction of Lombard Street / East Street / Dalby Road – there is insufficient width for two-lane busway and car traffic through the junction. A number of solutions exist including property acquisition on corner of Lombard Street / East Street or East Street / Dalby Road or bi-directional running through Lombard Street and the junction. The impact on the business case of these options would need to be considered.
- Crossing Bristol-Taunton mainline railway – either a new crossing is required or use of the existing crossing at Windmill Hill Close. There is insufficient width using Windmill Close for a two-lane busway and car traffic. The impact on the business case of these options would need to be considered.
- Alignment from Bedminster Station to Malago Vale Estate – there are a number of solutions which have different impacts. The section is restricted in terms of the space available between the mainline railway, back of houses in Cotswold Road, the St John's Burial Ground, the Malago Vale Estate and the Malago itself. Further detailed work is required to determine the viability of these solutions.
- St John's Lane/Bedminster Road/Francis Road – a crossing and alignment across this intersection is required. Suggested solution is widening of Francis Road to accommodate one parking lane and a two lane busway (which would need to be open to access traffic but not through traffic).
- Alignment along the Malago Greenway from St John's Lane to Hartcliffe Way – a number of new junctions are required which may require some property acquisition. These are the crossing of Marksbury Road, the crossing of Parson Street and where the Malago Greenway converges with Hartcliffe way at the front of the Bedminster Fire Station.
- Development at Hartcliffe – there is a current plan to redevelop the playing fields at the Hartcliffe Comprehensive School. Continuing the alignment from Hengrove through to the proposed Whitchurch Park and Ride requires an alignment through this area. Further work and consultation with the developers is required.
- Connection to Whitchurch Park and Ride - if an alignment through the playing fields can be established then an alignment through to Totshill Drive would require property acquisition to provide the link through to the proposed

development at Whitchurch.

## **Impact Assessment**

### ***Planning***

- 4.16 The South Bristol route takes advantage of certain lengths of the tram reservation in the 2003 Proposed Alterations to the Bristol Local Plan, in the Bedminster and Hengrove areas.
- 4.17 The proposed park and ride site, it is not currently identified in the BaNES Local Plan. The site is also in green belt. PPG13 contends that park and ride sites need to be subject to robust assessment including a sequential test to consider alternative sites, and non-green belt sites should be considered first although green belt sites may be the most sustainable of available options. The park and ride site would need to be judged against the criteria set out in PPG13, and currently it is unlikely to meet those criteria.
- 4.18 The Regional Spatial Strategy allocates up to 6,000 dwellings in the south-eastern extension to Bristol, of which a significant proportion can be expected to be delivered in the Whitchurch area. Large scale residential development is also likely to come forward in the Hartcliffe area, together with a degree of potential highway realignment and remodelling. Current planning applications and permissions include:
- Redevelopment of Hartcliffe Campus - received planning permission in September 2006. The playing fields do not allow a direct alignment through connection to Whitchurch.
  - Hengrove Park - planned to accommodate major redevelopment and is currently at the masterplan stage. The planned alignment of the BRT route alongside Whitchurch Lane should minimise any impact at this stage, and the development is likely to generate significant additional patronage for the route.
  - Lidl - recently submitted a planning application for a new store on Hartcliffe Way, immediately north of the proposed divergence point of the BRT route alongside the Malago. Whilst adjacent to the proposed route, the development is unlikely to have an impact on the alignment.
  - 'Marchioness' site south of the Wapping Road/Cumberland Road junction – application for residential development on the proposed BRT alignment north of Bedminster. This application was refused planning permission in October 2006 partly due to its conflict with the LRT protected alignment in the Local Plan.

### ***Environment***

- 4.19 The route is likely to require the conversion of significant lengths of waterway into culverts, which is likely to require substantial mitigation. Detailed biodiversity assessments will be necessary to inform this process. There is currently significant involvement from local communities in the Malago area with regard to wildlife surveys and monitoring on this corridor. The alignment on or adjacent to the Malago is also likely to be affected by flood risk.
- 4.20 Hengrove Park is designated as an SSSI, with SNCIs adjacent to Hartcliffe Way and north of the current Fire Station site.

- 4.21 The City Council's Air Quality Management Area extends into South Bristol and the area of Bedminster through which BRT is routed.

### **Land**

- 4.22 The Local Authority partners already own a significant part of the BRT alignment. These sections are shown in Table 4.2. The route from Wapping Road to Bedminster Rail Station is mainly on public highway.

**TABLE 4.2 LOCAL AUTHORITY LAND OWNERSHIP: HENGROVE/HARTCLIFFE CORRIDOR**

<b>Corridor Section</b>	<b>Description</b>
Bedminster Rail Station to St Johns Lane	Malago Greenway, Public Highway (Francis Road)
Bedminster Road to Marksbury Road	Malago Greenway
Marksbury Road to Parson Street	East side of Malago Greenway
Hartcliffe Way	Section from Bedminster Fire Station to Hengrove Park
Hengrove Park to Whitchurch	Properties Knightsbridge Park, Public Highway (Totshill Drive), Hartcliffe Community Park Farm

### **Demand Assessment**

- 4.23 Catchment analysis shows that there are around 22,000 persons in the Hengrove/Hartcliffe to Bristol City Centre corridor that would be within a 10 minute walk of a BRT stop (Table 3.2). Of these persons, 34% live in a household without regular access to a car. If the route terminated at Hengrove Park this would reduce to 18,000 persons.

**TABLE 4.3 HENGROVE/HARTCLIFFE TO BRISTOL CITY CENTRE CORRIDOR: CATCHMENT ANALYSIS**

<b>BRT Stop</b>	<b>Number households within 10 minute walk from BRT Stop<sup>1</sup></b>	<b>Number Persons within 10 minute walk from BRT Stop<sup>1</sup></b>	<b>% Households without Car<sup>1</sup></b>
Bedminster East	1,059	2,057	41%
Bedminster Rail Station	1,249	2,723	35%
Malago Vale	2,578	5,817	36%
Vale Lane	1,144	2,744	24%
Novers Lane	1,057	2,541	31%
Hengrove Park	1,021	2,463	37%
Rookery Farm	1,358	3,621	10%
Whitchurch P&R	141	382	15%
<b>Total</b>	<b>9,606</b>	<b>22,348</b>	<b>34%</b>

**Notes:**

1 – Source: 2001 Census data.







## 5. NORTH FRINGE TO BRISTOL CITY CENTRE

- 5.1 The North Fringe corridor is a fully segregated two-lane busway running from Broadmead along a new alignment to the rear of the new Broadmead development and along the River Frome to link with the M32 at the Easton Way junction and continuing along the southern side of the M32 to a new park and ride site at Broomhill. The corridor then leaves the M32 and continues along Stoke Way to UWE, crosses the A4174 Avon Ring Road along a new alignment through to meet up with Westfield Lane to Bristol Parkway. The corridor can then head west along the existing mainline railway to connect in to the new development at Filton Northfield and through to Cribbs Causeway or head through to Bradley Stoke up to Aztec West potentially also linking to Cribbs Causeway via the Coniston Bus Link.

### *Description of the Route*

- 5.2 From Broadmead a two lane busway runs towards the north-east would cross Penn Street and run between the Castlemead tower and the new Broadmead development along Philadelphia Court. It then crosses the realigned Bond Street and runs alongside the Broadmead development to continue along the approximate alignment of River Street. After crossing Wade Street, the alignment continues along Wellington Road/River Frome. The busway would leave the river alignment shortly before Junction 3 of the M32.
- 5.3 The suggested alignment on the M32 is a busway to the southern side. This involves reconfiguring the existing carriageway to provide a dual two-lane road for general traffic on the north-west side. The existing hard shoulders would be used to provide the extra width and it is assumed that the motorway would be declassified south of J1. To allow general traffic to exit at J2 (Muller Road) and J3 (Easton Way) new busway alignments would be constructed south of the exiting slip roads. At Easton Way (J3) the busway again leaves the motorway alignment outside the general traffic off-ramp and passes under the elevated roundabout via new underpasses. These will require reconfiguring the existing pedestrian facilities.
- 5.4 Since a new junction with Stoke Lane is required for BRT vehicles to serve the UWE Frenchay Campus, it is convenient to locate a park and ride site on land bounded by M32 to the north-west, Stoke Lane to the north-east and Frenchay Park Road to the south-east. This provides a sufficient length of (declassified) M32 south-west of J1 for traffic to slow and acclimatise to the new configuration alongside the busway.
- 5.5 The carriageway north-east of Stoke Lane is slewed onto the new alignment and a third lane created to provide a dedicated exit for cars to the park and ride site. A signalled junction is required at this point to allow cars exiting the park and ride site to join the north-eastbound carriageway. The busway ramp to/from Stoke Lane passes over this junction.
- 5.6 The busway heads north up Stoke Lane and Coldharbour Lane to serve UWE. At the junction of the Avon Ring Road (A4174) the busway continues north along a new alignment until it crosses Harry Stoke Road and connects with Westbury Lane, shortly joining Church Road to access Bristol Parkway Station.

- 5.7 From Bristol Parkway Station there are two possible branches.
- 5.8 One route could head west along the northern side of the existing mainline railway to connect in to Northway to use the existing underpass under Gloucester Road (A38). The busway would continue through the proposed development at Filton Northfield and connect in to the road network around Cribbs Causeway.
- 5.9 A second route could head east out the rear entrance of the Bristol Parkway car park to connect to Hunts Ground Road. From here the route continues up Bradley Stoke Way where it could run through as far as Aztec West or even Cribbs Causeway through the proposed Coniston Bus Link.
- 5.10 The North Fringe to Bristol City Centre alignment is shown in Figure 5.1.

**Operational Specification**

***BRT Services***

- 5.11 BRT services on this corridor would operate 10 minute frequency daytimes and a 30 minute frequency during the evenings and on Sundays and Bank Holidays, with a peak vehicle requirement of 8. In order to serve a projected new park & ride site off the M32 at Stoke Lane, it is proposed to operate a separate service on a 10 minute, Monday to Saturday daytime frequency, adding an extra 5 PVR and providing a 5 minute frequency between the park & ride site and Central Bristol.

***Changes to Bus Services***

- 5.12 Inter-urban routes X30, X40 and X42, the limited stop services between Chipping Sodbury, Yate and Bristol and service X62, the limited stop route between Mangotsfield, Bromley Heath and Central Bristol would use the BRT corridor between Stoke Lane and Central Bristol. These services are shown in Table 5.1.

**TABLE 5.1 EXISTING BUS SERVICES POTENTIALLY USING BRT INFRASTRUCTURE**

Service	Service Description	Buses per hour
X30/X40	Bristol – Yate/Winterbourne	2
X42	Bristol – Yate/Chipping Sodbury	1
X62	Central Bristol – Mangotsfield	1

- 5.13 With BRT specific services and the inter-urban services there would be a service level on the busway of 10 buses in the peak hour between the North Fringe and Bristol City Centre.
- 5.14 The potential service diagram is shown in Figure 5.2.

## Design/Engineering

5.15 There are a number of potential pinch-points along the route that have been identified. These pinch-points and recommended solution are:

- Castlemead Tower and the new Broadmead Development - insufficient space between the new development and the existing Castlemead Tower for a two lane busway, the corner of the new development overhangs Philadelphia Court on the corner of Philadelphia Court and Penn Street. This would restrict the busway through this junction to one lane only which could be controlled by reconfiguring the current signals at this junction.
- New Broadmead development - the Broadmead development extends over the old alignment of Wellington Road as far as River Street with the back of the development being car parking associated with the residential part of the development. An alignment through here will involve the removal of some of this parking.
- Wellington Road/River Frome - There is insufficient width along Wellington Road and the River Frome to retain the current two lane road and provide a two lane busway.
  - Closure of Wellington Road to car traffic - This option would convert Wellington Road to a busway. A new access for the streets south of Newfoundland Street would need to be found.
  - Shared use by traffic and BRT vehicles - There appears to be little traffic use of Wellington Road and therefore shared use with access-only vehicles may be possible.
  - Bi-directional running with rearrangement of access to streets south of Newfoundland Street.
  - Decking over the River Frome – the river could be decked over to provide a route for a two-way busway. The river is already culverted to the west of Wade Street.
  - A combination of any or all of the above to optimise the layout for all users and minimise the environmental impacts.
- M32, Junction 3, Easton Way - A segregated alignment through Junction 3 of the M32 requires reconstruction of the junction with a separate BRT alignment to the south of the junction past Millpond Street and out through the retaining wall in to the park by the River Frome. This would also require reconfiguration of pedestrian and cycle paths. This would be done in the context of the provision of a new BRT stop. Millpond Street access on to the M32 would be closed.
- M32 Junction 2, Muller Road - A segregated alignment through Junction 2 of the M32 requires reconstruction of the junction with a separate BRT alignment to the south of the junction and back on to the M32 using the existing slip road from Stapleton Road / Muller Road. Significant works would be required to construct a separate slip road off the M32 at the point of the Stapleton Bridge. The impact on the use of the slip road from Stapleton Road / Muller Road needs to be considered further.
- Provision of a park and ride site off the M32 will require a new access and

junction. The Highways Authority does not currently support new junctions off the motorway network.

- Stoke Lane - Stoke Lane would need to be widened at the southern end near the M32. This section is on embankment. It then widens out to Coldharbour Lane where the highway would widen in to the verge.
- Westfield Lane / Church Road - The alignment along Westfield Lane and Church Road may need widening in to the verge. The junction of Westfield Lane and Church Road is fairly restricted and there is likely to be a need for some land acquisition from the AXA business site to reconfigure the junction. This is a large site with a large area of landscaping adjacent to the fence line. The layout of the road, busway and junction from Westfield Lane to Brierly Furlong Road would depend on what option is chosen to cross the mainline railway from Bristol Parkway. This is discussed below.
- Bristol-Cardiff Mainline Railway crossing and Junction of Church Road / Brierly Furlong Road - The existing road underpass of the Bristol to Cardiff mainline railway is a tight section of two lane road, Brierly Furlong Road (on southern side) and New Road (on the northern side). This road is the main car access to Bristol Parkway station and therefore needs to be retained. It is also heavily used. New underpass east of the existing underpass through the railway embankment. This option would involve constructing a new tunnel under the mainline railway. The railway is on embankment at this point. Further work is required to identify how this works with the Bristol Parkway layout and tie in with Church Road. These works would require formal rail project procedures. Shared use of Brierly Furlong Road / New Road by BRT vehicles and cars. This option would mean the BRT vehicles would run with car traffic through this section. This section would need to be signalised to give priority to BRT vehicles turning on to / off of the busway to continue south/north. This would be a complicated set of movements with a junction on either side of the mainline railway for BRT on Brierly Furlong Road / New Road.
- Crossing the Mainline Railway and Aggregate Works at Filton - Between Bristol Parkway and Filton Northfield the busway would run along the northern side of the Bristol-Cardiff mainline railway. This would require three crossings of the rail network: the line running north-east between Bristol Parkway and Patchway, the line running north-south between Patchway and Filton Abbey Wood and the line running north-west between Patchway and North Filton. Each of these would require formal rail project procedures. The area north of the mainline to Cardiff between the line running north-south between Patchway and Filton Abbey Wood and Gloucester Road (A38) is currently used as aggregate works. The impact would be acquisition of an alignment through this site.
- Filton Northfield Development - A new development at Filton Northfield proposes to redevelop the land between Gloucester Road (A38) and Cribbs Causeway. A route for BRT through this development needs to be identified and secured as well as accesses to and from the development site.
- Rear Entrance Access from Bristol Parkway Car Park - The existing rear entrance access from Bristol Parkway car park is on Hunts Ground Road. This access provides an opportunity to link Bradley Stoke Way with Bristol Parkway via Hunts Ground Road. Hunts Ground Road is largely used as an informal car park for the train station. Removal of this car parking would provide more space within the highway network. It is likely that some widening in to the verge would also be required. Further work is required to determine whether both a two lane road and two lane busway can be retained. The cessation of works at the Royal Mail depot means that traffic on this street is probably restricted to car park users.

Options therefore include: Two lane busway and two lane road with establishment of parking restrictions on Hunts Ground Road and widening in to verge. Two lane busway with closure of Hunts Ground Road. All car park access would be via New Road. One lane busway with two lane road with establishment of parking restrictions on Hunts Ground Road and widening in to verge. Two lane busway with bi-directional on Hunts Ground Road with establishment of parking restrictions on Hunts Ground Road and widening in to verge. Shared access by BRT vehicles and car-park traffic.

## **Impact Assessment**

### ***Planning***

- 5.16 The North Fringe route is not covered by any reservation in the Bristol Local Plan. The proposed route between Parkway and Bradley Stoke is protected as a rapid transit route in South Gloucestershire's Local Plan.
- 5.17 The alignment on the M32 corridor will require sensitive detailed design in terms of its relationship with Dower House (an historic landscape issue), together with restoration aspirations for the Stoke Park area. The key issue from a local plan perspective is the inclusion of a park and ride site on Stapleton Smallholdings.
- 5.18 Policy M4 of the 1997 adopted Bristol Local Plan permits park and ride facilities but no site to serve the M32 is designated. The Stapleton smallholdings site is covered by a range of green belt and conservation policies, and a proposal would need to demonstrate that the benefits of park and ride development on this site would outweigh the impact on these policies in order to gain planning permission. The Stapleton site is also not designated for P&R in the 2003 alterations to the Bristol Local Plan.
- 5.19 PPG13 contends that park and ride sites need to be subject to robust assessment including a sequential test to consider alternative sites, and non-green belt sites should be considered first although green belt sites may be the most sustainable of available options. A park and ride site on the Smallholdings site will need to be judged against the criteria set out in PPG13, and currently it is unlikely to meet those criteria, in particular as it is not included in the Joint LTP. A planning application would therefore be likely to be called in by the Secretary of State as it represents a departure from the Local Plan.
- 5.20 Symonds Group undertook a site assessment study in January 2004. 2 sites prioritise for detailed appraisal, by the Junction 1 of the M32 and the Stapleton Smallholdings site. The study concluded that both sites provide excellent potential for park and ride but that Junction 1 site performed better, due to having more scope for growth and not dependent on de-trunking of the M32. It is likely that a park and ride strategy will need to be produced to support any planning application on the smallholdings site, and the sequential tests undertaken by Symonds in 2004 may have to be revisited. There may be potential to revise the assessment criteria to reflect the current proposed route option for BRT.
- 5.21 Current planning applications and permissions along the route include:

- Large mixed use development between Millpond Street and Junction 3 of the M32 – unless modified, the application would conflict directly with the proposed BRT alignment and comments on the application from the Council’s Highways Development Control team have taken account of this and recommended a reduction in the size of the proposal.
- Harry Stoke – a significant residential development is planned for Harry Stoke. A north-south reservation of Rapid Transit has been provided.
- UWE Masterplan - significant elements of the University of the West of England masterplan are now under construction. The central bus station has been retained and there are clear opportunities to deliver a high quality BRT alignment either alongside the campus or to route vehicles into the bus station.
- Filton Northfield development - the site is likely to accommodate 2,200 new dwellings with further supporting employment. An emphasis has been placed on bus infrastructure within the site and there are clear opportunities to modify the proposed BRT alignment to reflect this to provide an attractive and reliable east-west link.

**Environment**

- 5.22 The BRT route would have a significant impact on the Frome in the Wellington Road area, with significant culverting likely. This may conflict with aspirations to open up the Frome in this area through the creation of an urban park. The creation of significant lengths of culvert may also increase flood risk.
- 5.23 The underground section of the Frome in the vicinity of Junction 3 has sluices to control city centre flooding, and any structural amendments in this area may need to take this into account.
- 5.24 Bristol City Council’s Air Quality Management Area extends along the length of the M32 and the specification of BRT vehicles will need to take account of this. The route proposes significant changes to Junction 2 of the M32, and the impact of these changes to general traffic movements will need to be modelled to determine their impact on vehicle emissions. There may be a need for a Biodiversity Impact Assessment in the section of route north of the M32.

**Land**

- 5.25 The majority of the route is within existing highway, although the M32 is still within the control of the Highways Agency. The alignment south of Junction 3 not within highway is owned by the City Council, together with the alignment through Eastville Park and the Stapleton Smallholdings site, Table 5.2.

**TABLE 5.2 LOCAL AUTHORITY LAND OWNERSHIP: NORTH FRINGE CORRIDOR**

Corridor Section	Description
Bristol City Centre to Stoke Lane	Riverside Park, Eastville Park, P&R site



## Demand Assessment

- 5.26 Catchment analysis shows that there are around 10,000 to 18,000 persons in the North Fringe to Bristol City Centre corridor that would be within a 10 minute walk of a BRT stop, depending on the route option taken (Table 5.2). Of these persons, 17% to 27% live in a household without regular access to a car.

**TABLE 5.3 NORTH FRINGE TO BRISTOL CITY CENTRE CORRIDOR: CATCHMENT ANALYSIS**

BRT Stop	Number households within 10 minute walk from BRT Stop <sup>1</sup>	Number Persons within 10 minute walk from BRT Stop <sup>1</sup>	% Households without Car <sup>1</sup>
Stapleton Road	2,034	4,617	36%
M32 P&R Broomhill	787	1,934	31%
UWE	102	284	9%
Bristol Parkway	495	1,189	10%
Filton Northfield	469	1,169	19%
Filton Airfield	404	1,052	12%
Cribbs Causeway	30	76	9%
Great Stoke	1,129	2,846	6%
Bradley Stoke	1,740	4,059	5%
Patchway	1,578	3,758	7%
<b>Total to Cribbs Causeway</b>	<b>4,320</b>	<b>10,321</b>	<b>27%</b>
<b>Total to North Fringe</b>	<b>7,865</b>	<b>18,687</b>	<b>17%</b>

Notes:

1 – Source: 2001 Census data.





## 6. BRISTOL CITY CENTRE ROUTES AND STOPPING PATTERN

### Overall Principles

- 6.1 The initial specification for the BRT alignments is to aim for a two-lane, 100% segregated busway along entire corridors. This is to ensure that reliability and journey times for the new mode are optimised to offer an attractive service and maximise mode shift from the private car. On the corridors themselves this objective is almost entirely achievable without significantly compromising general traffic capacity and conventional bus operation.
- 6.2 The city centre presents more significant challenges if a 100% level of segregation is to be achieved. Substantial demands exist for capacity for general traffic movement, kerb side space for parking, loading and bus stop requirements, and there is a clear need to maintain and if possible enhance bus stopping capacity to ensure that the new system does not reduce bus reliability or passenger facilities in the city centre. In addition, priority measures for BRT will also present opportunities to improve bus services in certain areas. The system may also facilitate future opportunities for enhancements to the public realm.
- 6.3 A key issue is provision for general traffic movement. The city centre has limited existing capacity for east-west movement for general traffic between the western approaches and the city's historic core, which currently is funnelled via Baldwin Street from the Park Street and Anchor Road approaches. Due to competing demands for highway movements in the area between The Hippodrome and Colston Avenue (known as 'The Centre'), this route would be likely to be closed to general traffic if an entirely segregated BRT route was to be implemented in the city centre. This issue needs to be approached sensitively as it would result in a substantial diversionary impact for general traffic, with additional congestion and a potentially negative network impact for the scheme, which would need to be off-set by substantial further patronage gains from private cars onto the new system. Highway works on diversionary routes would also be need to be designed, costed and implemented as part of the scheme.

### Design Process

- 6.4 Assessment of the city centre alignments has therefore concentrated on using and extending existing bus priorities, whilst minimising the impact on general traffic where possible. The design work undertaken to support the Supertram alignment in the city centre has been utilised where possible, as this route was designed to provide a largely segregated route from Temple Meads to The Centre and Broadmead and included detailed highway design and traffic modelling.
- 6.5 In addition, the city centre routes will need to facilitate flexible operation for BRT vehicles. In particular, the routes need to provide for both through operation between routes and terminating or turning facilities for each route.

### Bus Services

- 6.6 A key issue is interaction with existing and planned bus services. Two joint officer

workshops were held in February and March with representatives from First to consider how the BRT routes could complement bus route aspirations in the city centre. These meetings have progressed an ongoing bus service review to simplify bus routing patterns and concentrate on an orbital route structure through the city centre for bus operations, capitalising on route options for BRT.

- 6.7 This review has resulted in the identification of a two stage bus routing review for city centre bus services. Stage 1 of the review, to be delivered in tandem with BRT, retains one-way bus operation on Rupert Street and Quay Street/Nelson Street corridors and maintains general traffic movements through The Centre, but takes advantage of further bus priorities to be delivered by BRT. Stage 2 is a longer term aspiration to facilitate two-way segregated bus operation on Rupert Street between Broadmead and The Centre, with wider ranging restrictions on general traffic movement.
- 6.8 In addition, discussions have been undertaken with officers within Bristol City Council's traffic signal team to confirm the viability in principle of the bus priority proposals, subject to detailed design and modelling at a later stage.

#### **BRT Alignment Options and Priority Measures**

- 6.9 Figures 6.1 and 6.2 illustrate alignment options to facilitate BRT routes from Emerson's Green, Ashton Vale and South Bristol. Figure 6.1 assumes that Emersons Green services approach the city centre via Temple Meads station, whilst Figure 6.2 shows an alternative option for the Emerson's Green approach from Old Market (refer to technical note `Alignment Report and Pinchpoint review). Both routes have adopted an orbital principle connecting Broadmead with The Centre and taking advantage of existing bus priority measures where possible and proposing additional measures to further improve reliability.
- 6.10 Figure 6.3 shows a further alignment to facilitate the route from the North Fringe. It should be noted whilst Baldwin Street is unaffected for the Emerson's Green, Ashton Vale and South Bristol corridors, the addition of the North Fringe route will be likely to require the use of Baldwin Street for BRT vehicles, which in turn may necessitate a restriction on westbound general traffic movement on the Baldwin approach to The Centre and a possible further restriction on Wine Street. Alternatively, BRT from the North Fringe could run via Union Street although this alignment will be longer, will be likely to result in additional running time and may require a further restriction on general traffic movement on Union Street.

#### **Bus Priority Measures**

- 6.11 Details of the proposed bus priority measures are provided in Table 6.1.









TABLE 6.1 BUS PRIORITY MEASURES IN BRISTOL CITY CENTRE

Route Section	Description	Impact	Highway Capacity Impacts <sup>3</sup>	Notes	Route
Redcliffe Way	Segregated westbound alignment from Temple Meads replacing the existing Redcliff Hill roundabout with a traffic signal junction.	Westbound traffic would be restricted to BRT vehicles (restriction could be two-way depending on which option for outbound movement is selected).  Significant potential for realignment and public realm improvements in this area facilitated by the scheme.	Significant diversionary impact towards the York Road and Clarence Road area.	Bristol City Council's traffic signals team are currently bringing forward proposals to reduce congestion on these routes which would assist with the accommodation of diversionary traffic from such a measure.	Emersons' Green Temple Mead option only
Prince Street Bridge	Closure to general traffic to accommodate modification to or replacement of the bridge to facilitate BRT.	Closure of the bridge to general traffic.  Potential decongestion benefit of mode shift from car to bus, park and ride and BRT and the further benefit for pedestrians and cyclists travelling to and from the south Bristol.	Increased traffic on Redcliff Hill to the east and Brunel Way to the west.	Traffic flow crossing the bridge was reduced substantially as a consequence of the closure of Broad Quay to general traffic, and there is a current proposal to install shuttle signals on the bridge to improve pedestrian and cycle infrastructure.	Ashton Vale Hengrove/Hartcliffe

<sup>3</sup> All of the measures described will require detailed modelling before the likely impacts described here can be confirmed.

Route Section	Description	Impact	Highway Capacity Impacts <sup>3</sup>	Notes	Route
The Centre Option 1	BRT interchange in the Cenotaph area	<p>Restrictions on general traffic movement:</p> <ul style="list-style-type: none"> <li>• restriction of the south to north 'U' turn movement from the Rupert Street direction to buses only</li> <li>• Closure of the access from St Stephens Street into Colston Avenue</li> <li>• A potential restriction of westbound traffic from Baldwin Street to movements towards Park Street and Anchor Road only (ie it would no longer be possible to drive a car from Baldwin Street north towards Lewins Mead).</li> </ul>	Should maintain current general traffic capacity for the majority of movements.		Ashton Vale Emersons' Green Hengrove/Hartcliffe North Fringe
The Centre Option 2	Alternative arrangement for the Cenotaph area	<ul style="list-style-type: none"> <li>• Provides for southbound traffic on Colston Avenue (west), retains the existing signal phasing arrangements and significantly improves southbound bus stopping capacity</li> <li>• Closure of the access from St Stephens Street into Colston Avenue</li> <li>• The current 'U' turn manoeuvre prohibited for buses as well as general traffic (a 'U' turn facility for buses is provided at the Broad Quay/Prince Street junction).</li> </ul>	Should maintain current general traffic capacity for the majority of movements.	Provision of an active use in the Cenotaph area may facilitate future opportunities for public realm enhancements.	Ashton Vale Emersons' Green Hengrove/Hartcliffe North Fringe

Route Section	Description	Impact	Highway Capacity Impacts <sup>3</sup>	Notes	Route
Baldwin Street	Traffic restrictions on Baldwin Street.	General traffic movement from Baldwin Street towards Rupert Street restricted.	Further modelling will confirm whether a restriction on traffic exiting Baldwin Street northbound is feasible or desirable. It is assumed that such a measure will not be essential to BRT operation although the reduction in traffic in The Centre would have significant benefit for BRT and bus services with an additional public realm improvement.	Potential partial restriction on movements from Baldwin Street is likely to result in a diversion of approximately 400 vehicles per hour, towards the Wine Street and Union Street alternative north-south corridor.	Ashton Vale Emersons' Green Hengrove/Hartcliffe North Fringe (North Fringe has an additional impact above diversion of around 400 vehicles per hour)
St James Barton, Haymarket and Rupert Street	Expansion of the existing westbound bus lane is already provided along Bond Street, The Haymarket and Rupert Street.	Bus lane widened by reducing capacity for general traffic to one lane from the two lanes currently provided. Provides for passing of vehicles at bus stops. Will also provide benefits for existing bus services and potentially bring forward additional bus stops on The Haymarket and Rupert Street.	May result in extended queuing on the A38 and Bond Street approaches to the St James Barton junction, although the potential relief to queuing traffic from mode shift onto the BRT system will also have a positive impact. Possibility of queuing traffic into Bond Street from Haymarket.	May need to consider diverting further westbound through traffic via Marlborough Street as part of the proposal.	Ashton Vale Emersons' Green Hengrove/Hartcliffe North Fringe
The Horsefair	Restrict general traffic access into the Horsefair after 11 am.	Provide a much improved environment for buses and BRT, improving journey times and bus stopping arrangements.	Currently there are no general traffic restrictions on The Horsefair. Traffic diversion likely via Bristol Bridge and Counterslip.	The details of this proposal will need to be carefully considered in terms of the level of permitted access, consultation with businesses and the precise operating times of the restriction.	Ashton Vale Emersons' Green Hengrove/Hartcliffe North Fringe

Route Section	Description	Impact	Highway Capacity Impacts <sup>3</sup>	Notes	Route
Old Market Street	Extension existing southbound bus lane and signal changes to The Friary.	Existing southbound bus lane would be extended back towards Old Market roundabout.	Additional pre-signal on The Friary will be necessary to enable the outbound BRT vehicle to cross over the Friary and re-join the inbound route.		Emersons' Green Old Market Street option only

- 6.12 With the exception of the approach to and from Temple Meads Rail Station via Redcliffe Way, all proposed routes in Figures 6.1 to 6.3 can currently be undertaken using existing highway infrastructure, although with a significantly greater level of shared running with general traffic.
- 6.13 Overall, the routes proposed generally build on existing bus priorities and are not considered to require significant reductions in capacity for general traffic. Discussions with First arising through the officer workshops have highlighted a future aspiration to consider two-way buses on Rupert Street between The Centre and Broadmead, which could form a further staged improvement to public transport accessibility in the city centre, although this would be at the expense of general traffic capacity and is outside the scope of this working note.
- 6.14 The North Fringe route is more complicated to accommodate than those from Emerson's Green, Ashton Vale and South Bristol and is more likely to bring forward further general traffic restrictions. For this reason it may be less well suited to early consideration as part of the route prioritisation process.
- 6.15 The overall objective this area of work has been to ensure that viable city centre alignments can be implemented for BRT, subject to detailed design and further assessment of impact on traffic capacity. By reliance on existing and future bus priority measures, together with the use where applicable of the existing protected alignment for the Supertram, route options can be accommodated which will enable reliable service operation whilst keeping the diversionary impact on general traffic to a minimum.

## 7. SUMMARY AND RECOMMENDATIONS

### Summary

- 7.1 The Ashton Vale to Bristol City Centre route has a level of reliance on the development at Ashton Park. This development has not yet been allocated in the final Regional Spatial Strategy. The Examination in Public for this will be completed by Summer 2007.
- 7.2 The Emerson's Green to Bristol City Centre route has some clear benefits in terms of the area it serves, high potential patronage and mode shift from the private car, its connection with new development and its completeness or sustainability as a potential BRT corridor.
- 7.3 The Hengrove/Hartcliffe to Bristol City Centre route is the least strong of the options in terms of potential benefits, however, there are opportunities to de-scope the works and reduce the capital cost. This could improve the economic case for the route.
- 7.4 The North Fringe route, whilst having some clear benefits, has a number of deliverability issues. The high cost of the route to Cribbs Causeway identified at the long-list stage can be overcome by taking a route through to Bradley Stoke. This would still not complement the GBBN Corridor 1 proposals for the M32. Making use of the M32 GBBN improvements and providing a BRT link north of the M32 is an option that would overcome this, but this does not provide a complete BRT corridor for the first route of a BRT network in terms of public perception and provision of an alternative mode.

### Recommendations

- 7.5 Therefore it is recommended that:
- The Emerson's Green to Bristol City Centre route with an extension to Long Ashton Park and Ride, including the on-street works in Bristol City Centre, is pursued at this stage as the next RFA BRT route. This requires:
    - A full costing of the route.
    - Development of a procurement strategy including a full review of policy and planning requirements.
    - An environmental scoping exercise to be completed as soon as possible. Environmental surveys commence Summer 2007.
    - A full communications strategy including key stakeholder discussions commencing Summer 2007.
  - If the proposed Ashton Park development is confirmed in the final Regional Spatial Strategy then the route connecting the development can be taken forward as a further section of the BRT network in the RFA programme and should be worked up in conjunction with other transport proposals for the new development and, potentially linked with Bristol International Airport.
  - The two other routes are worked up for potential inclusion in the TIF package

(scheme submission December 2007). Options for the further routes to be assessed should include:

- Hengrove/Hartcliffe:
  - Fully segregated route.
  - De-scoped route.
- North Fringe:
  - M32 to Bristol Parkway.
  - Bradley Stoke to Bristol Parkway.
  - Cribbs Causeway to Bristol Parkway via Filton.
  - Cribbs Causeway to Bristol Parkway via Bradley Stoke.
- All four routes are worked up in consideration of the BRT Line 1 in Bath so an integrated BRT network is developed.
- A final decision on the RFA scheme be taken at the time of the TIF submission should a TIF scheme be put forward to DfT. In the event that a TIF scheme is not submitted, sufficient work will have been undertaken on all four routes to allow for a review of the RFA programme at that stage.