

## Executive Summary

### Background to the Study

The Greater Bristol Strategic Transport Study (GBSTS), undertaken by the consultant team led by Atkins, developed a series of transport strategies for the Greater Bristol sub-region covering the period to 2031, with intermediate years of 2011, 2016 and 2021. This report outlines the development and appraisal of the transport strategies.

GBSTS has its origins in the London to South West and South Wales Multi-Modal Study (SWARMMS) which explored the needs to 2016 of the main east-west transport corridors between London/South East and the South West. Within SWARMMS, insufficient time was available to deal in detail with the complex issues of the Greater Bristol sub-region. GBSTS followed on from SWARMMS, with the objective of fulfilling this requirement, building and drawing on the work undertaken by SWARMMS, but not constrained by it.

The principal partners for the study included:

- ◆ Department for Transport/Government Office for the South West;
- ◆ South West Regional Development Agency;
- ◆ Highways Agency;
- ◆ Bath & North East Somerset Council;
- ◆ Bristol City Council;
- ◆ North Somerset Council; and
- ◆ South Gloucestershire Council.

The study has been guided by a Key Stakeholder Advisory Group (KSAG) drawn from representative organisations with an interest in transport planning and operations in the study area. In addition to the study partners listed above, the KSAG included:

- ◆ South West Regional Assembly;
- ◆ Business West;
- ◆ Joint Strategic Planning and Transportation Unit;
- ◆ Strategic Rail Authority (until June 2005); and
- ◆ Sustainability South West.

In brief specified that GBSTS should:

- ◆ develop a series of integrated multi-modal transport strategies over time (detailed strategies for 2011 and 2016 and broader, high level, strategies for 2021 and 2031) for the study area identifying, analysing and appraising solutions on the national strategic transport networks, on the local strategic transport networks and at the interface between them, so as to improve strategic transport movements into, out of and through the study area;

- ◆ develop transport strategies that support existing economic activity, continue sustainable development and assist economic regeneration of urban areas and the wider process of urban renewal within the study area; and
- ◆ reduce the impact of transport on the environment.

Furthermore, in developing and appraising the strategies, the study was required to 'make focused and realistic recommendations on transport policy and infrastructure provision across all modes and networks, focusing on the period to 2016 and taking full account of potential funding and deliverability constraints'. Hence, the strategies that are developed need to be both affordable and implementable.

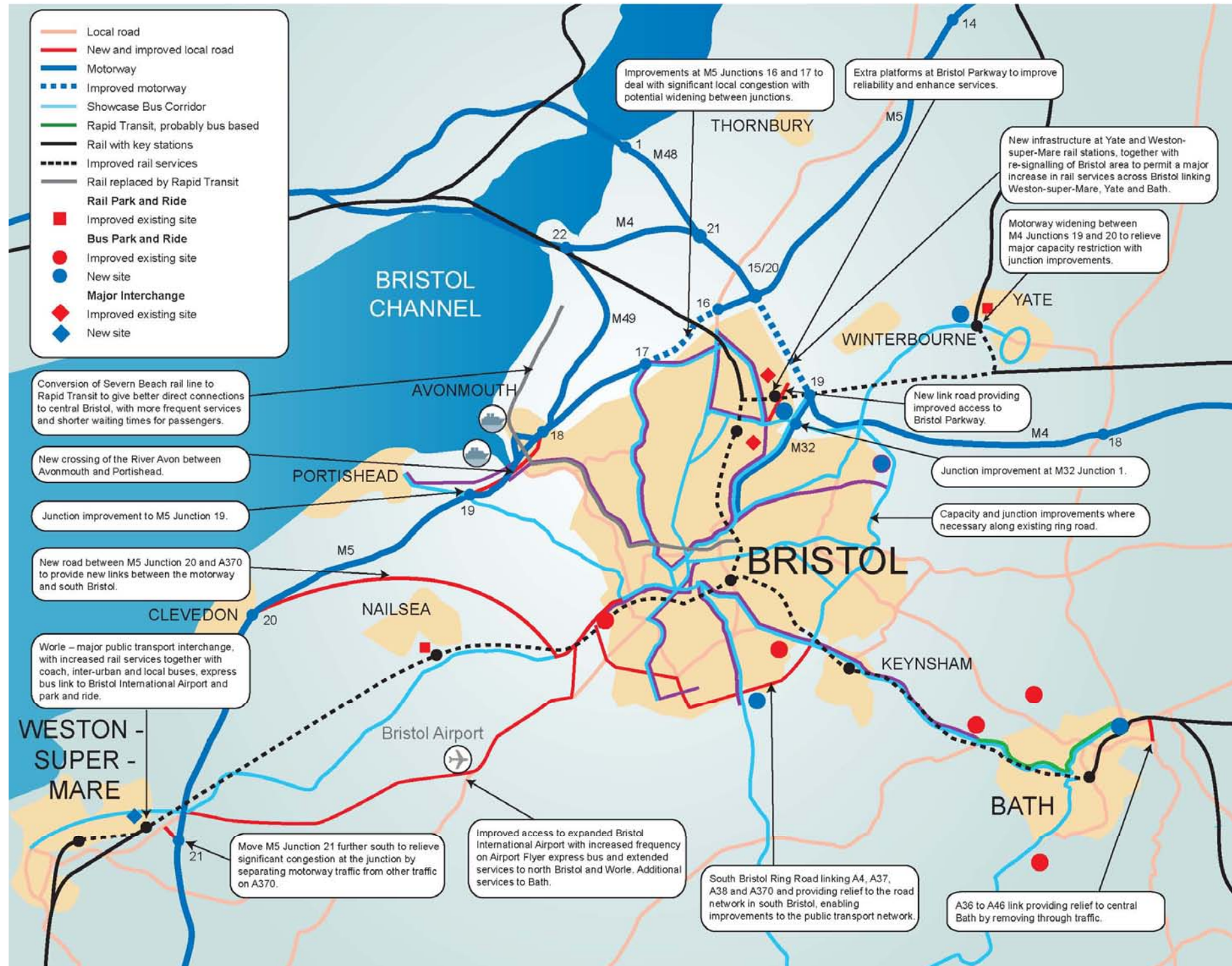
### **Growth in the Demand for Travel**

The development of the GBSTS transport strategy up to 2031 was based on significantly increased demand for travel, of which a key factor was the projected growth in population and employment within the Greater Bristol area, with the associated rise in freight movements. Working with the West of England Partnership, GBSTS prepared travel forecasts for 2031 based on 138,000 extra dwellings in the study area, equivalent to population growth of 245,000 from the existing 990,000. For employment, the forecast increase was 95,000 jobs in addition to the current workforce of about 500,000.

The additional dwellings were split between 78,000 on brownfield sites in existing built-up areas and 60,000 on greenfield sites formed by extensions to the principal urban areas, particularly Bristol and Weston-super-Mare. Further travel would be generated by growth in activity at BIA with air passenger numbers rising from the current 4 mppa to 12 mppa by 2031 with an associated increase in employee levels.

The growth in travel demand resulting from the increased population and employment would be significant. However, the growth is constrained by the limited capacity on the transport system which results in the suppression of some journeys. Nevertheless, even with some suppression, the additional demand creates severe problems for the operation of the transport network. By 2031, the study forecast a 34% rise in the number of vehicle trips on the road system in the morning peak but the limited capacity results in a 35% drop in average speeds from 44 km/hour to 28 km/hour and an increase in delay of 230%, indicating a large-scale growth in congestion. The rise in traffic occurs particularly on the motorway network, with a further 3000 passenger car units in the peak between 2003 and 2031 across the M5 Avonmouth Bridge and between Junctions 19 and 20 of the M4. Bus operators experience the impact of increased congestion on the road network with bus speeds dropping between 20% and 40%. Consequently the car mode share rises from 88.8% in 2003 to 90.8% in 2031. The decline in bus use is offset to a limited extent by an increase in rail patronage, although the restricted coverage and capacity on the rail system constrains the growth in passenger levels with a significant rise in crowding on trains.

# Transport Strategy



## Across the Study Area

- Significant improvements in bus services through extended bus priority measures, bus lanes, etc with faster and more reliable services, higher frequencies, more cross-city services and better, fully accessible vehicles.
- Expanded network of Rapid Transit services providing faster journey times using dedicated sections of road where possible and 'state of the art' vehicles.
  - Ashton Vale - Emersons Green
  - Hengrove - North Fringe
  - Whitchurch - Portishead
  - Bath - Cribbs Causeway
- Newer trains on local services with additional capacity. Better integration with local bus services. Increased parking capacity at key stations. Improved cycle facilities at stations.
- Extended network of interurban bus services with a wider variety of potential destinations.
- Expansion of Park and Ride network.
- Range of complementary measures to encourage the use of alternative modes, including improved pedestrian facilities, increased cycling facilities and better design of new residential and commercial developments.
- Extensive introduction of workplace and school travel plans and car sharing to strongly encourage alternatives to the car.
- More efficient use of the motorway network to reduce incidents and provide better driver information through improved communications and Variable Message Signs. Investigate introduction of High Occupancy Vehicle lanes on motorways.
- Increased parking charges within city centres, especially for long stays and linked to park and ride improvements.
- Development of workplace parking changes and cordon user charging and introduction of area-wide road user charges.





The series of transport measures designed to cater for and accommodate the projected growth in demand for travel are outlined below and summarised on the attached diagram. The measures are considered in the following sequence which reflects the strategy development and appraisal process:

- ◆ encouraging the use of alternative modes;
- ◆ management of travel demand;
- ◆ public transport improvements; and
- ◆ highway measures.

### **Measures to Encourage the Use of Other Modes**

Before embarking on measures that are potentially costly in resources or finance, in developing the transport strategy it was important to explore measures which are designed to influence the decision to make a journey to a particular destination or to encourage the use of alternative modes.

The transport strategy has been prepared against a background of significant developments in population and employment. The design and implementation of the new developments should be planned so as to reduce the total volume of travel and encourage the use of alternative modes to the car. Such policies should include the concentration of developments within transport corridors easily served by public transport; the creation of a mix of developments so that more activities are easily reached by walking or cycling; and an increase in the density of development such that there is a choice of facilities within a reasonable distance. Furthermore, the design of developments (especially major residential schemes), should pay particular attention to their operation in the most sustainable way.

Although detailed schemes to enhance walking and cycling are outside the scope of a strategic study like GBSTS, there are nevertheless benefits to be achieved from providing attractive schemes and facilities to encourage greater levels of these activities. At the same time, other policies, such as demand management or 'Smarter Choices' will encourage the use of alternative modes in general and hence will stimulate walking and cycling, if the supplementary measures are in place.

The expansion of initiatives under the heading of 'Smarter Choices' can have a positive impact on the overall volume of travel and the level of car use. Some of the policies contained in 'Smarter Choices' are within the responsibility of the public sector including workplace travel plans, school travel plans, car sharing schemes and car clubs. The unitary authorities within the Greater Bristol area already actively pursue these measures, and it is vital that renewed and enhanced efforts are made to expand their coverage. This will require a continuous application of resources to maintain the impetus and continue the level of benefits. The impact of 'Smarter Choices' would be strengthened and supported by other policy measures such as demand management which would provide further encouragement for the use of alternative modes. It is estimated that a comprehensive policy of 'Smarter Choices' combined with other complementary measures could reduce person trips in the study area by car by around 10%. Other elements of 'Smarter Choices' could include teleworking, tele-conferencing and home shopping; while these features would contribute to the use of alternative modes, much of the initiative behind them would come from market forces,

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with the savings and benefits obtained by the private sector. Hence, because they are generally outside the control or influence of local authorities, their promotion is not included in the GBSTS transport strategy.

It will be important to develop the full potential of the range of approaches to encourage alternative modes before embarking on major infrastructure developments. However, there needs to be awareness that continued promotion of the measures is necessary if the full impact is to be achieved and maintained and therefore resources must continue to be allocated to 'Smarter Choices' in the future.

### **Demand Management**

Within the transport strategy, it is important to include measures designed to control or manage the level of demand for travel by car across the study area. A number of measures to manage demand are available for implementation now and concentrate on varying the availability and cost of parking. The policies need to be adjusted and refined in order to reflect the growth in car traffic, by increasing charges, controlling the number and availability of spaces, raising enforcement, introducing controlled parking zones, exploring ways of controlling parking at Cribbs Causeway and introducing stringent parking standards. The expansion and variation of parking policy measures also need to take into account the potential impact on economic activity, especially within city and neighbourhood centres, in order to ensure that the prosperity of the centres is maintained.

The range of additional policy instruments to manage traffic demand includes workplace parking charges. Although there are potential limitations to the impact that such measures may have, it remains a possible tool for introduction in areas outside the scope of existing parking policy, e.g. the North Fringe, and hence should be examined further. The introduction of workplace parking charges would strengthen the operation of workplace travel plans.

However, the most effective additional form of demand management is likely to be some type of road user charging. The study has identified a number of potential charging mechanisms, including bridge tolls, cordon charging, motorway tolls, supplementary licences, congestion charging and distanced-based charging. In the longer-term, the study believes that the most effective form of demand management would be an area-wide charge. However, it is unlikely that such an approach would be feasible until later in the study's horizon and hence it is important to explore charging systems that provide the opportunity for more immediate implementation. A cordon-based charge would be the most appropriate technique and the initiative by unitary authorities within the Transport Innovation Fund should be taken forward as quickly as possible.

The study does not believe that the introduction of tolls on the motorway network would produce overall benefits with the likelihood that such a system would encourage the diversion of traffic onto the uncharged local roads, generally unsuitable for the traffic volumes, and with only a small change in the overall level of traffic across the study area. For many of these journeys, there is a lack of an attractive public transport alternative. Hence, an area-wide road user charging system would be the most suitable long-term approach. We have examined alternative forms for the area-wide road user charging scheme and believe that the most appropriate is one in which the charge varies with the

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level of congestion. As highlighted earlier, the benefits from charging are greater where the congestion is more severe. By varying the charge in line with the level of congestion, it is therefore possible to optimise the level of benefits. It is estimated that, with such a variable charge in 2031, it would be possible to reduce total vehicle delay across the study area by 20% and increase vehicle speeds by 9% for a lower average charge (14p/mile) than with a simple distance based charge of 50p/mile on all roads in the study area.

## Public Transport Improvements

The study has examined a wide range of potential improvements to the public transport system in order to cater for the general growth in the demand for travel across Greater Bristol. The particular components of the public transport measures within the transport strategy range from improvements to the local bus services through to an expansion of the rail network.

Improvements to **urban bus services** would be a main focus in the strategy for enhancing the public transport system in the short to medium term. The Showcase bus corridors which form the Greater Bristol Bus Network are the subject of a Major Scheme Bid within the Local Transport Plan process and include a package of measures with junction improvements providing priorities for buses, new bus lanes, improved bus shelters, real-time passenger information and new low-floor buses. It is important that the Greater Bristol Bus Network is introduced as soon as practical.

Extensions to the **park and ride system** would involve expansion at the existing sites in Bristol and Bath to increase the capacity and improve the facilities. New sites are also identified in the strategy at Emersons Green, Hambrook, Whitchurch, Nibley and Lambridge.

The detailed consideration of **inter-urban bus services** is outside the main scope of GBSTS. Nevertheless, it is possible to identify new connections that would be necessary following the new population and employment developments across the study area. In addition, extensions to the highway network will provide the opportunity to offer service improvements such as journey time cuts and reliability gains on existing routes or through a re-routing of services. The network of services will need to be reviewed in association with the priority measures in the Greater Bristol Bus Network together with the introduction of rapid transit routes and improvements to rail services.

Extensions to the **coach services** in the strategy would be a combination of enhanced operations through the use of priority measures within the Greater Bristol Bus Network together with potential new stopping locations outside city centres at the new Worle Parkway Interchange, Lambridge Park and Ride and in north Bristol at Parkway/UWE/Hambrook.

A particular growth area of future travel is **BIA** and public transport access to the airport must be enhanced to accommodate the growth in both air passengers and workers at the airport. The strategy identifies the current Flyer service as the foundation for future expansion, with increased frequency on the existing route together with expansion to serve north Bristol (Parkway) and Worle Interchange (for both Weston-super-Mare and the wider South West region). To cater particularly for the airport workers, a demand-responsive or shared taxi operation would be the most appropriate means of serving the widespread destinations.

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The strategy identifies a number of **public transport interchanges** which should be developed outside town or city centres to serve local developments, including Worle Parkway (with multi-modal activity), UWE (serving the North Fringe), Yate and Filton Abbey Wood rail stations.

A major area of new development for the public transport system involves the network of **rapid transit** lines which would build on the priority measures within the Greater Bristol Bus Network to produce a system with further priorities including segregation from general traffic wherever possible. The lines would be designed to serve many of the new residential and employment developments, with the initial plans comprising:

- ◆ Ashton Vale – Emersons Green;
- ◆ Hengrove – North Fringe/Cribbs Causeway;
- ◆ Bath – Cribbs Causeway; and
- ◆ Whitchurch – Avonmouth/Portishead.

An early element of the rapid transit network would operate in Bath between Lambridge and Newbridge as part of the Major Scheme Bid which is being prepared within the JLTP process.

Further work is required to identify the type of vehicle used to operate the service but modern, low-floor, articulated buses are likely to be the most appropriate, flexible and cost effective vehicles to satisfy the requirements of the service. Further work is also necessary to specify the precise routes, taking into account the desire for significant levels of segregated operation.

The **rail** network within Greater Bristol represents a potential resource capable of wider and more intensive use although there are limitations brought about by the number and location of existing rail lines. The restricted penetration of the rail network into the city centres of Bristol, Bath and Weston-super-Mare and the poor links to the North Fringe contribute to low levels of current rail use, with just 2% of journeys in the morning peak period.

A range of measures has been identified to improve and expand the rail network, taking into account the availability of resources within the industry:

- ◆ improved rolling stock providing increased capacity and speed enhancements on the local rail services;
  - ◆ additional facilities at Bristol Parkway with initially three and ultimately four platforms to increase capacity and improve reliability;
  - ◆ expanded facilities at Worle station to create a major interchange location, including platform lengthening and an expansion of services;
  - ◆ new turn-back facilities to enable more trains to operate to/from Weston-super-Mare and Yate; and
  - ◆ increased services across Bristol linking Weston-super-Mare, Yate and Bath Spa – in view of the restrictions in turning trains at Bath Spa, it may be necessary to extend the local services to Westbury to provide better connections between the west Wiltshire towns of Trowbridge and Bradford-on-Avon and the employment centres of Bath and Bristol.
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Although some of the improvements could be introduced in the short-medium term, the full extent of service increases would be dependent on the re-signalling of the Bristol area which is likely to be completed by 2018.

### Highway Measures

The approach adopted within the study for the development of the transport strategy concentrated on examining and promoting alternatives to the private car before considering improvements to the highway network. This was designed to ensure that highway measures are only considered after all other possibilities have been explored. Within the highway improvements themselves, the emphasis was placed on making best use of the existing infrastructure before examining the need for schemes which increase highway capacity.

The examination of highway improvements was undertaken against the background of significant growth in the demand for travel in line with a 25% rise in population and 20% growth in employment by 2031. The identification of enhancements to highway capacity took direct account of the location, scale and timing of these developments; in some cases, additional highway infrastructure is necessary to connect new developments into the existing network.

The emphasis in identifying measures to make best use of the highway network in the study area concentrated on the existing infrastructure and capacity on the motorway and major trunk roads, although many of the measures are also suitable for the local network:

- ◆ **planned maintenance** should continue to be programmed to minimise disruption by avoiding periods of peak daily and seasonal flows, including the main summer holiday periods;
- ◆ wider measures to **reduce incidents** through better driving training, increased enforcement, stricter penalties and greater use of advanced warning signs;
- ◆ continued development of **incident management** by speeding up detection, evidence collection and documentation, incident clear-up and the initiation of diversionary routes; and
- ◆ wider application of **signing, surveillance and automated systems** including active traffic management techniques.

The assessment of capacity enhancements across the study area's highway network considered a number of potential new schemes and appraised the full range of impacts before developing a preferred package of improvements. The identification of schemes concentrated on those which would have a direct impact on the strategic highway movements across the study area. The schemes within the strategy would not be the only highway measures which would generate potential enhancements; local measures, outside the scope of GBSTS, could also have merits but would need to be progressed separately by the local authorities. Hence, the schemes identified in the strategy are concentrated on the strategic highway network in the area.

The principal schemes which the study recommended should be taken forward included:

- ◆ South Bristol Ring Road between A4 and A38

South Bristol experiences severe congestion on the constrained highway network in the area together with restricted accessibility to other parts of the study area, particularly the new employment areas of the North Fringe. Accessibility would be enhanced by extension of the Avon Ring Road with an indicative alignment from the junction with the A4 at Hicks Gate, following a new alignment south-west of Whitchurch to the A37, then running south of Hengrove before heading north to junction at Hartcliffe Way and Hengrove Way and finally, following an on-line alignment through Withywood before skirting Highridge Common to the A38. The scheme produces significant benefits through reduced delays across south Bristol, creating major new connections between south Bristol and the major employment areas. The scheme shows a strong economic performance with NPV of £950 million and BCR of 16.
- ◆ A38 – A370 Link

Extension of the South Bristol Ring Road from A38 through to the A370, with the study's preferred alignment following the path of the earlier Red route. The scheme provides relief to the congestion on the B3130 through Barrow Gurney and produces a strong economic performance with NPV of £70 million and BCR of over 8.
- ◆ Links between south Bristol and M5

Current congestion levels on the highway network on the approaches to south Bristol from the south west would be exacerbated by planned future developments in housing and employment together with growth at BIA. The study identified alternative schemes to improve the connections to south Bristol and from the M5 motorway and the South West. The northern route would link M5 Junction 20 to the A370 near Long Ashton along an alignment to the north of the B3130 and would include bypasses for Nailsea, Tickenham and Wraxhall. The southern route would link M5 Junction 21 at Weston-super-Mare with BIA and northwards to the A370 with a bypass of Barrow Gurney. Outline alignments for the schemes have been identified for the purposes of the appraisal but considerable detailed work is necessary in order to identify potential environmental and other constraints. Both alternatives have strong transport economic case with a NPV of £270 million and a BCR of over 5 for the Junction 21 route and a NPV of £160 million and BCR of 3 for the Junction 20 option.
- ◆ Improvements to M5 Junction 21

Current conflict at this junction, between traffic wishing to access the M5 and through movements on the A370 between Weston-super-Mare and Congresbury/south Bristol, will worsen with future growth in traffic. The most effective approach identified by the study is to separate the two movements by constructing a replacement junction to the south of the current Junction 20 which would be accessed by a new link to the A370 in Weston-super-Mare. The existing Junction 20 would be closed for access to the M5 and would therefore be restricted to A370 traffic alone. The scheme produces a strong economic performance with a NPV of £150 million and a BCR of 3.
- ◆ M4 Widening between Junctions 19 and 20

The need to increase the capacity from three to four lanes in each direction on this section of the motorway was highlighted by forecast traffic flows consistently exceeding 85% of current capacity. Considerable journey time savings are achieved producing a NPV of £350 million. Due to an increase in distances travelled and a rise in vehicle operating costs, there is a growth in government indirect tax revenue which produces a negative BCR (-5). Despite this anomaly, the overall scheme performance is strong.

- ◆ M5 Junctions 16 and 17 and M32 Junction 1  
Problems at Junction 16 are created by a combination of high traffic levels to/from Aztec West and the North Fringe, conflicts between through traffic on the A38 and motorway access/egress and the proximity of Junction 16 with Almondsbury Interchange. Junction 17 serves the Cribbs Causeway regional shopping centre as well as other local destinations and experiences significant congestion, particularly on Saturdays. High traffic volumes through M32 Junction 1 create peak period congestion difficulties, exacerbated by the proximity to M4 Junction 19. Schemes to improve the operation of these junctions have been identified including the enhancement of the on and off slip roads and changes to the local road network and produce benefits to traffic movements. A more detailed assessment of operation of the junction is required, which is outside the scope of the study, before a full appraisal of the scheme can be completed.
- ◆ Second Avon Crossing  
M5 between Junction 18 and 19 is one of the few crossings of the River Avon and is a critical section of the region's strategic road network. Incidents on this section have a widespread impact across the region and traffic levels are influenced by high levels of local traffic including movements to, from and between the two port areas on opposite banks of the river. The proposed second crossing would relieve the motorway and its junctions and improve access to Portishead and Avonmouth. The study has identified a potential low level crossing including an opening bridge or barrage which, in addition to carrying normal traffic, would also include a rapid transit link to Portishead. Because the scheme runs parallel to existing infrastructure, the journey time savings are low with a NPV of £30 million and BCR of 1.6 although this excludes the benefits from rapid transit and the improved resilience of the highway network.
- ◆ A36 to A46 Link Road  
The link road was recommended for further development by the earlier Bristol Bath to South Coast study. Located to the east of Bath, it produces significant benefits within Bath, through reduced congestion in the city on the A4 and A36, and traffic relief in the west Wiltshire towns of Trowbridge and Bradford-on-Avon. The overall economic performance is strong with a NPV of £700 million and BCR of 27 but there are significant environmental impacts which will need to be considered in the further development of the scheme.
- ◆ Winterbourne and Stoke Gifford Bypasses  
The scheme provides substantial relief to roads in the North Fringe including A38 and B4057 Winterbourne Road. The majority of the benefits occur south of the M4 and the northern section does not significantly add to the benefits and hence should not be progressed unless there are changes to developments in the area. The Stoke Gifford bypass and southern section of the scheme produces a NPV of £260 million and BCR of 8 and hence should be progressed further.

A number of additional schemes for highway capacity improvement were examined but were not included in the GBSTS strategy.

- ◆ M4 to A4174 Link Road  
The potential alignment for the scheme would involve close inter-relationship with M4 Junction 19 and a number of alternative designs were examined with the most effective being the construction of a new M4 junction (18A) with access limited to motorway traffic to/from the east and closure of the east-facing slip roads at the existing Junction 18.
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Such a scheme in isolation recorded a NPV of £270 million and BCR of 12 but the generation of additional traffic on the M4 to the east of the new junction would create the need to add an additional lane on the M4 through to Junction 18 and hence the scheme was not recommended by the study.

- ◆ **A4 Salford Bypass**

The scheme would relieve the congestion from traffic passing through the village but would involve high construction costs due to the terrain through which it would pass. Hence, the scheme's economic performance, with a NPV of £17 million and BCR of 1.2, does not justify its inclusion in the strategy; although it produces some local relief, the strategic benefits are limited.

- ◆ **A37 Whitchurch Bypass and Callington Road Link**

These two schemes were identified as providing local relief to the highway network rather than having a strategic impact and hence were not included in the strategy although they produced a reasonable economic performance. Some of the benefits from the Whitchurch bypass would be achieved by the wider South Bristol Ring Road.

- ◆ **Clutton and Temple Cloud Bypass**

The construction of bypasses for the two neighbouring villages on the A37 would provide local relief but would not have a strategic impact.

- ◆ **Banwell, Churchill and Sandford Bypasses**

The three adjacent communities on the A371, A368 and A38 experience local congestion which is exacerbated by the restricted capacity through the village centres. The study examined the impact of a series of bypasses to provide relief to the villages and identified that, because the use of bypasses would increase the length of journeys, the net impact of the schemes was diminished such that the overall NPV was -£2 million with a BCR of 0.96. The scheme was therefore considered to have local rather than strategic merits and was not included in the GBSTS strategy.

- ◆ **M49/Sevenside Intermediate Junction**

Projected increases in employment within the Sevenside area are not sufficient to justify the potential highway improvements which include a new junction on the M49 and construction of a Spine Road through the main development area. While there are potential travel time savings for traffic to/from Sevenside, the volume of traffic is small and the benefits do not justify the high scheme costs.

## **Freight Aspects**

Although the movement of freight was not identified as a major feature of the GBSTS, measures designed to relieve particular congestion locations will also generally benefit goods traffic whether on the road or rail network. Other measures with a specific freight interest have been identified within the study, although a detailed appraisal has not been undertaken:

- ◆ review of the consolidation trial for goods deliveries to Broadmead area, with potential expansion in terms of types of goods covered and the extent of the area served;
- ◆ increased publicity for freight routes within and through the area and the facilities available to HGV drivers; and



- ◆ accommodation of potential expansion in rail freight opportunities from Royal Portbury and Avonmouth Docks.

### **Appraisal of the Strategy**

The contents of the GBSTS strategy and their impacts have been appraised under the key headings of environment, safety, economy, accessibility and integration. The detailed appraisals are summarised in the Appraisal Summary Table for the strategy shown in the attached table which highlights the key features in the appraisal of the strategy.

### **The Next Steps**

The recommendations from the study outlined in this report will be presented to the partner group comprising officers from the organisations listed earlier. Having reviewed the outcomes from the study, the officers will develop recommendations on which schemes and measures should be taken forward by their organisations, identifying a potential timetable for implementation.

The Secretary of State for Transport and elected members of the unitary authorities will then consider which schemes and measures should be taken forward. Once decisions have been made, further work will be undertaken on the schemes and measures to enable them to be entered into the appropriate programmes of the Department for Transport, the Highways Agency and the unitary authorities. The schemes and measures will then be subject to the normal statutory planning processes.

One of the key aspects will be the potential sources of funding for individual schemes. These will depend upon the characteristics of the scheme, but will include Local Transport Plan, Regional Funding Allocation, Highways Agency and Network Rail budgets together with potential contributions from local developers and possible revenues from road user charging and other demand management measures. The development and appraisal of the schemes will need to make particular reference to the requirement of the appropriate funding processes.

The Secretary of State for Transport has asked the South West region to advise him on its priorities for transport investment in the next ten years or so. The recommendations from GBSTS will assist the region to understand the benefits of the schemes and measures, in terms of supporting future prosperity in Greater Bristol by investing in transport, compared with other areas in the South West. The advice to the Secretary of State will be based on evidence from GBSTS.

The study has been progressed in an open and consultative manner and the possible options have been discussed publicly. Many of the proposals are at a very early stage in the planning process and, if the recommendations are accepted, considerable further work will be required to prepare and consult on detailed designs for the schemes, including specific route alignments.



**Appraisal Summary Table for GBSTS Strategy**

GBSTS Strategy		Problems: congested road network with lack of high quality public transport options		Present Value of Costs to Public Accounts £1,103M
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
Environment	Noise	Small net decrease in the number of people annoyed by noise (based on perceptible changes in noise levels). Increase in noise levels along new highway links on strategic road network. Decreases in noise spread across the study area network. The appraisal excludes the potential impacts attributable to the use of low noise surfacing and noise barriers in new schemes which would further reduce levels of noise pollution.	Number of zones experiencing noise impact: - Increase in population annoyed – 28 zones - No change in population annoyed – 82 zones - Decrease in population annoyed – 77 zones	Net decrease in estimated population annoyed of 16,800.
	Local Air Quality	Reduction in emission levels of NO <sub>x</sub> and PM <sub>10</sub> between 2003 and 2031 through increasing use of cleaner, more efficient engines and improved fuels. Further moderate improvements achieved in 2031 by the strategy for both NO <sub>x</sub> (2%) and PM <sub>10</sub> (4%) compared with Do Minimum. Within the local Air Quality Management Areas, there are reductions in emissions compared with 2031 Do Minimum. For NO <sub>x</sub> reductions are 3% (Avonmouth), 7% (Bristol) and 8% (Bath) and for PM <sub>10</sub> a 4% drop in Bath and no change in Avonmouth and Bristol. The appraisal excludes impacts attributable to possible supporting measures such as roadside emissions testing, low emission zones and the further development of low emissions technologies.	- Total annual emissions (tonnes) – NO <sub>x</sub> : - Base (2003) – 13033 - Do Minimum (2031) – 7150 - Strategy (2031) – 6980 Total annual emissions (tonnes) – PM <sub>10</sub> : - Base (2003) – 416 - Do Minimum (2031) – 196 - Strategy (2031) – 188	Changes in: NO <sub>x</sub> : -170 tonnes pa (-2.4% change) PM <sub>10</sub> : -8 tonnes pa (-4.1% change)
	Greenhouse Gases	A moderate (5%) reduction in CO <sub>2</sub> emissions in 2031 making a contribution towards meeting the UK Government's obligations under the Kyoto agreement on tackling climate change. Due to growth in development between 2003 and 2031, the level of CO <sub>2</sub> emissions increases by 33% between 2003 and 2031 Do Minimum.	Total annual emissions (tonnes) – CO <sub>2</sub> : - Base (2003) – 2027705 - Do Minimum (2031) – 2694531 - Strategy (2031) – 2559328	Changes in: CO <sub>2</sub> : -135203 tonnes pa (-5.0% change)
	Landscape	Impacts of specific strategy measures on individual landscape designations: - South Bristol Ring Road – potential impacts at western and eastern ends of the route; - Airport Link Road – potentially significant impacts on landscape in the Wrington area - M5 Junction 17 – possible impact on local landscape designations to west of existing junction; and - A36 – A46 Link Road – potentially significant impact on AONB. Remedial measures may need to be included within the design as schemes are developed.	N/A	Potentially large adverse impact
	Townscape	Impacts of specific strategy measures on individual townscape designations: - South Bristol Ring Road – parts of the urban sections of the route (Bishop Ave, Hawkfield Rd, Hengrove Way, Cater Rd Link, King George's Rd, Highridge Grn) could have potential townscape impacts; and - Stoke Gifford Bypass – potential local impacts. Remedial measures may need to be included within the design as schemes are developed.	N/A	Potentially moderate adverse impact
	Heritage of Historic Resources	Impacts of specific strategy measures on individual heritage designations: - South Bristol Ring Road – runs through Avon Conservation Area in Highridge and Withywood area; - Airport Link Road – runs very close to Scheduled Ancient Monuments at Nye, Redhill and Felton; - Nailsea Bypass – passes close to, but does not directly impact on, a Scheduled Ancient Monument at Wraxall and listed garden at Tyntesfield; - Widening of A370 – lies close to a Scheduled Ancient Monument and runs through a narrow band of Avon Conservation Area; - Improvements to M32 Junction 1 – could potentially impact on Avon Conservation Area to the north-east of the junction; and - A36 – A46 Link Road – runs close to Avon Conservation Area. Remedial measures may need to be included within the design as schemes are developed.	N/A	Potentially moderate adverse impact
	Biodiversity	Impacts of specific strategy measures on individual biodiversity designations: - South Bristol Ring Road – runs close to small ancient woodland at eastern end; - Airport Link Road – skirts SSSI between Nye and Congresbury, crosses Local Nature Reserve along disused rail line between Congresbury and Winscombe, runs through ancient woodlands north of Wrington; - Nailsea Bypass – skirts northern boundary of SSSI across Tickenham Moor; - Second Avon Crossing – runs close to important bird area when it crosses River Avon; - Improvements to M5 Junctions 16 & 17 – close proximity to areas of ancient woodland; and - A36 – A46 Link Road – passes close to small SSSI. Remedial measures may need to be included within the design as schemes are developed.	N/A	Potentially moderate adverse impact
	Water Environment	Impacts of specific strategy measures on individual water environment designations: - South Bristol Ring Road – runs close to a number of landfill sites at western end; - Airport Link Road – crosses fluvial flood plain between Nye and Congresbury, crosses the flood plain of River Yeo to the south of Wrington, crosses Source Protection Zones near to	N/A	Potentially moderate adverse impact

GBSTS Strategy		Problems: congested road network with lack of high quality public transport options		Present Value of Costs to Public Accounts £1,103M
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
		<p>BIA and runs close to landfill sites north of BIA;</p> <ul style="list-style-type: none"> <li>- Nailsea Bypass – runs through flood plain between Tickenham and Nailsea;</li> <li>- Second Avon Crossing – runs within tidal flood plain of River Avon and at southern end near to landfill sites;</li> <li>- Widening of A370 – runs close to landfill sites;</li> <li>- Widening of M4 between Junctions 19 and 20 – lies close to landfill sites and crosses Bradley Brook;</li> <li>- Stoke Gifford Bypass – crosses small streams;</li> <li>- Improvements to M5 Junctions 16 &amp; 17 – close proximity to landfill site near Junction 17; and</li> <li>- A36 – A46 Link Road – crosses River Avon.</li> </ul> <p>Remedial measures may need to be included within the design as schemes are developed.</p>		
	Physical Fitness	Promotion of walking and cycling measures and reduced car use through transfer to public transport would increase physical activity and fitness.	N/A	Moderate beneficial impact
	Journey Ambience	Various measures potentially reduce stress for drivers (through improved journey reliability, e.g. Variable Message signs, reduced congestion) and public transport passengers (improved journey times, real-time passenger information).	N/A	Moderate beneficial impact
Safety	Accidents	Transfer of traffic onto new higher standard roads reduces overall accident levels.	Annual weekday casualty levels: 2003 – 398 KSI 2031 (Do Minimum) – 365 2031 (Strategy) - 329	PVB £681M
	Security	Improved public transport security through better facilities at stops, real-time passenger information.	N/A	Moderate beneficial impact
Economy	Public Accounts	Significant public sector expenditure, particularly on public transport and highway schemes.	Central Government PVC: £703M, Local Government PVC: £399M	PVC £1,103M
	Transport Economic Efficiency: Business Users and Transport Providers	Large travel time savings, especially for freight, with smaller vehicle operating cost savings. Significant time savings for public transport operators.	Users PVB: £13,743M, Transport Providers PVB: £4,414M, Other PVB: £0M	PVB: £18,158M
	Transport Economic Efficiency: Consumers	Large travel time savings for users, with smaller operating cost savings.	Users PVB: £15,603M	PVB: £15,603
	Reliability	Additional highway capacity will reduce congestion and improve reliability. Extended use of Variable Message Signs will improve reliability on the motorway network.	Proportion of vehicle-kms below capacity: Base – 91% Do Minimum – 69% Strategy – 86%	Moderate beneficial impact
	Wider Economic Impacts	Current and future population have improved accessibility to work particularly in south Bristol.		Moderate beneficial impact
Accessibility	Option Values	Significant increase in level of public transport provision through bus, rapid transit park and ride and rail improvements.	Increase in public transport capacity between Do Minimum and Strategy: Rail – 20% Bus and rapid transit – 102% Park and Ride – 109%	Large beneficial impact
	Severance	Individual highway schemes will increase local severance although detailed scheme design should include mitigation measures to maintain current links.	N/A	Slight adverse impact
	Access to Transport	Improved accessibility to main city/town centres. North Fringe and BIA for both public transport and highways.	Extra population within 60 mins – public transport Bristol city centre – 515,000 Bath city centre – 56,000 Weston-super-Mare – 53,000 North Fringe – 61,000 BIA – 62,000 Extra population within 30 mins – highways Bristol city centre – 623,000 Bath city centre – 21,000 Weston-super-Mare – 60,000 North Fringe – 210,000 BIA – 533,000	Large beneficial impact
	Accessibility for the Disabled	Introduction of new vehicles on bus, rapid transit and rail services with low floor access and designated areas for disabled.	N/A	Moderate beneficial impact
Integration	Transport Interchange	Improved interchange through developments including expansion of interchanges (at Worle, Bristol Parkway and UWE.), enhanced network of rapid transit and rail services, increased provision of park and ride. Improved real-time information for passengers.	N/A	Moderate beneficial impact
	Land-Use Policy	Spatial development forecasts have been key input to strategy development process. Close liaison with West of England Partnership in preparation of Sub-Regional Spatial Strategy.	N/A	Moderate beneficial impact
	Other Government Policies	Strategy assists other Government policies (e.g. sustainability and social inclusion) through improvements to public transport services and changes in mode split.	N/A	Moderate beneficial impact