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# Greater Bristol Metro

Bristol Area Rail Study – Final Report

West of England Partnership

February 2013

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## West of England Partnership

February 2013

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## Document history

### Greater Bristol Metro

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## Executive Summary

This report provides a summary of the ongoing work in developing the operational and business case for the Bristol Metro Phase 1. The overall picture has not changed radically since the April 2012 report, but the detail and rigour within the analysis is improving all the time. Three key areas are covered in the report:

- Rail Operations
- Demand & Revenue
- Wider Economic Effects

### Rail Operations

The overall findings are that the basic half hourly operation on the three lines of Bristol Metro work. Although the RailSys modelling indicates there is now no need for the additional turnback at Bathampton Junction operationally, retaining the provision of this infrastructure would enable greater future flexibility of the network. Similarly, the Clifton Down double-track loop is not operationally required to deliver the Bristol Metro network, however including the scheme within the proposals would provide further flexibility and elasticity of the infrastructure.

There are also a number of observations on the layouts provided at Bristol East Junction and Filton Bank which would provide greater flexibility in operation of all services through the site by allowing for more parallel movements.

### Demand Forecasting and Revenue

This section has revised the demand and revenue forecasts and developed the socio-economic case for the scheme. The revisions have focussed on adding rigour to the analysis through the use of industry revenue analysis tools MOIRA2 and the regional transport model GBATS, as well as more up to date information on base rail demand.

In carrying out economic analyses, we have utilised a higher capital cost estimate of £40.22m. This includes the initial estimate of Phase 1 capital costs at £35.66m (which in turn includes Portishead re-opening works and a Bathampton turnback facility), with the addition of an allowance of £4.56m for extending the Severn Beach line passing place at Clifton Down to form a double-track section from Clifton Down to Redland stations, although this is not considered an essential infrastructure element of Phase 1. Opening year is assumed as 2017.

The MOIRA2 model in particular has added rigour on ticket yield, and well as competitive responses to the proposals from within the rail industry. The key findings are:

- The central case operating subsidy requirement is around £1.2m per annum;
- Sensitivity analysis suggests this figure can vary from break-even to a loss of around £1.5m; and
- Key sensitivity factors are levels of growth in the early years, and assumptions of scheme operating costs.

The economic case for the scheme appears strong – the central case estimate is 2.5.

## Economic Development

In December 2012, Atkins produced a report on behalf of the West of England Partnership outlining the GVA impacts of major transport schemes in the West of England, which includes the Bristol Metro Network Proposals for Phases 1 and 2, as well as New Stations Package (from Halcrow's April 2012 study).

The results of the Atkins impact assessment:

Scheme	Forecast Outturn Cost (£m)	Present Value of Costs (£m)	Increase in GVA (2030) (£)	Increase in GVA per Unit Cost
Rail schemes (Metro, New Stations)	£91m*	£77m*	£153m	2.0

\* Initial estimates of costs for rail schemes and Temple Quarter Transport Package, to be confirmed following further study

## Wider Regional Linkages

Combining individual station figures gives estimates of total potential revenue that various options for extended services could achieve. Additional revenue has also been added for Salisbury, Frome and Castle Cary as appropriate, in turn based on patronage and revenue effects at Bath Spa and Bristol Temple Meads modelled in Phases 1. Potential revenues for station combinations and 'terminating at...' extended service options are shown below:

Terminating at...	Revenue	Station
Westbury	£250,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge
Salisbury	£300,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge, Westbury, Dilton Marsh, Warminster
Frome	£300,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge, Westbury
Castle Cary	£340,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge, Westbury, Frome, Bruton
Taunton	£200,000	Highbridge & Burnham, Bridgwater
Gloucester	£130,000	Cam & Dursley

Revenues are 2011 values per annum

# 1 Introduction

## 1.1 Background

The confluence of rail industry changes in the Greater Bristol Area offer an exciting opportunity to change the shape of Inter-Urban and commuter rail services in the region. Electrification of the Great West Line with associated infrastructure works, a new fleet of inter-city trains, and the roll out of the first new model franchises are happening at the same time. Add to the mix the opportunity for devolution of rail powers to the region and the potential this creates is exciting.

The initial Greater Bristol Metro Study primarily investigated how the region should respond to the franchise renewal opportunities, and considered what a coherent, plausible and deliverable response to that process should be.

Time frames and availability of information inevitably led to the need for a number of assumptions to be made. Moreover, the level of uncertainty on the specific details of infrastructure changes has also meant certain assumptions needed to be made.

Halcrow endeavoured to produce an assessment with cross checks, a dialogue with the rail industry, and as such have identified further work required to develop this project. This report outlines the findings of that further work thus far.

## 1.2 Project Brief

The concept of a Bristol Metro has been submitted for priced options to the Department for Transport (DfT) as part of the First Great Western (FGW) franchise renewal process. The work undertaken to-date has been sufficient to develop the proposals, but require more investigative work to support the development of the scheme over the next few months.

The main element of this further work includes the development of initial business case - to refine, increase robustness and develop scheme economics for the first time. These areas include economic development impacts and development of modelling suites.

Whilst developing the business case for the Greater Bristol Metro, this study will also briefly consider potential wider regional linkages available for the network proposals.

An additional task includes providing technical support to bidders throughout the franchise process, as there is a need to actively engage with the shortlisted bidders. This is to ensure they understand the concept of what is being proposed and also so they understand the local enthusiasm for the scheme, particularly with respect to the need for capital funding.

All correspondence with bidding Train Operating Companies (TOC) will be documented as part of this study.

### 1.3 Structure of the Report

This interim report is outlined as follows:

**Chapter 2** – Summary of Initial Feasibility Study for Greater Bristol Metro

**Chapter 3** - Rail Operations

**Chapter 4** - Demand Forecasting and Economics

**Chapter 5** - Economic Development Impacts

**Chapter 6** – Consideration of Wider Regional Linkages

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## 2 Summary of Initial Feasibility Study for Greater Bristol Metro

### 2.1 Introduction

Before investigating further details of Greater Bristol Metro – Phase 1, we have restated the findings from the initial feasibility study completed earlier April 2012.

### 2.2 Findings

The introduction of a basic Bristol Metro service is achievable. A three-branch service pattern incorporating:

- Re-opening of Portishead line;
- Additional stopping services on the Severn Beach line;
- Additional stopping services between Bath and Bristol; and
- Delivering the following service levels:
  - Half hourly services on Portishead line;
  - Half hourly services on the Severn Beach line; and
  - Half hourly stopping services between Bath and Bristol.

The above service levels can be achieved with necessary capital funds to deliver Portishead line re-opening, with a possible requirement for a turnback facility at Bathampton Junction and extension of the passing loop at Clifton Down.

Capital costs of £40.22m have been utilised in the economic analyses of the scheme going forward. This includes the initial estimate of Phase 1 capital costs at £35.66m (which in turn includes Portishead re-opening works and a Bathampton turnback facility), with the addition of an allowance of £4.56m for extending the Severn Beach line passing place at Clifton Down to form a double-track section from Clifton Down to Redland stations, although this is not considered an essential infrastructure element of Phase 1. Outturn costs in 2017 are forecast to be some £46m (without Clifton Down).

Table 2-1 illustrates the initial Greater Bristol Metro network proposals.

Revenue estimates suggest the scheme has the potential to break even, but is likely to require operational funding to around £800k per annum. The final figures are highly dependent on views of the franchise bidders and commercial risks they are willing to take.

Although a further development-based set of schemes were also developed in the initial study (Henbury Line and Yate service enhancements), the demand on these services is linked to additional developments coming forward. Therefore they have not been considered in detail within this study.

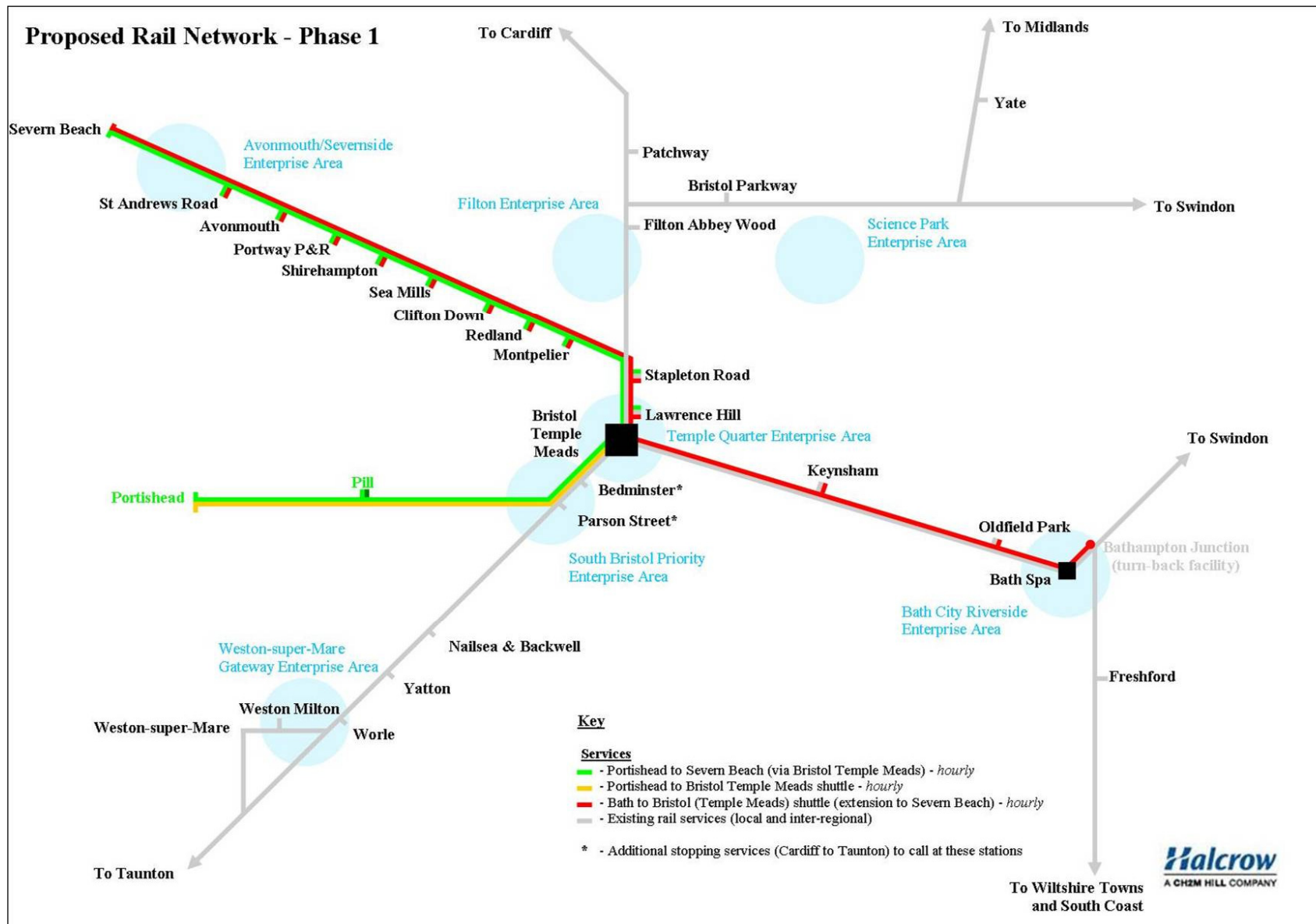
## 2.3 This Study

This study is based on the same operating assumptions. The focus is to add more rigour in terms of operational analysis as well and demand and economics. The next section will consider:

- Operational Planning work
- Demand and Economics work
- Links to the wider rail network.

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Table 2-1: Greater Bristol Metro – Phase 1 proposals



## 3 Rail Operations

### 3.1 Introduction

The initial study into the operational work identified that it should be possible to operate a half hourly service on the Portishead line, along with an additional stopping service between Bath and Bristol, and the development of the Severn Beach line into a half hourly operation.

A number of caveats lay behind those outputs, not least the extent and layout of Bristol East Junction and Filton Bank post electrification, and the need to accommodate freight growth within the plans for the Bristol area. The focus of this stage has therefore been to develop our understanding of the related issues in each case.

### 3.2 Discussions with Stakeholders

#### 3.2.1 Network Rail

An initial meeting was held between Halcrow and Network Rail on 9<sup>th</sup> July 2012. This provided an opportunity for initiating a programme for information exchange, as well as discussing Greater Bristol Metro proposals and Network Rail's forward work programme for the study area. Supplementary questions were raised by Halcrow at this stage, with regards to infrastructure proposals for Bristol East Junction (BEJ), to which Network Rail responded in September with a proposed option for BEJ which is currently in the GRIP 2 stage of investigation.

The four-tracking of Filton Bank is part of the proposals for BEJ, the availability of this infrastructure and future timescales are integral to the Greater Bristol Metro network proposals; as these proposals are reliant on four-tracking at Filton Bank to be able to operate to the proposed schedules.

Appendix A has a proposed option from Network Rail's GRIP 2 for Bristol East Junction (received from Katharine Campbell on 12<sup>th</sup> September), including provision for four-tracking at Filton Bank. It should be noted that according to Network Rail, a final layout cannot be provided at this stage; however the layout identified is one of the better performing modelled options. Further discussions with Network Rail indicate that other options have been under consideration at GRIP 2 level, and that NR is aiming to optimise capacity, flexibility, cost and ease of construction.

During the initial meeting and throughout subsequent correspondence with Network Rail officers, it should be noted that no major concerns have been raised over the proposed Greater Bristol Metro network, in terms of operations or deliverability.

Future dialogue is programmed to continue to develop these proposals and ensure information continues to flow between parties.

### 3.2.2 Bristol Port Rail

During discussions with Bristol Port Rail (BPR), Halcrow outlined the initial study proposals and future freight capacity estimations for Bristol Port, which include:

- BPR expect that more freight capacity will be needed than is currently planned for, with an assumption of 20 trains per day contracted for Portbury. This could risk restricting Portishead proposals to an hourly passenger service. BPR also regard reconnecting the carriage line at Parson Street as a prerequisite for Portishead passenger reintroduction.
- At Avonmouth, BPR expect up to 33 trains per day in the long term if their future development plans are successful. However it should be noted that this is three times what Network Rail identified during their last discussions with Halcrow.

The above requirements reflect BPR's development aspirations and the peak path availability that they anticipate would be needed to adequately serve them. Therefore much of the highest levels of pathing requirements depend on market developments and planning consents.

### 3.2.3 Train Operating Companies

The DfT announced the four shortlisted Train Operating Companies to run the Great Western Franchise from July 2013. These include:

- First Great Western Trains Limited (FirstGroup plc);
- GW Trains Limited (Arriva UK Trains Limited – DB(UK) Investments Limited);
- NXGW Trains Limited (National Express Group PLC); and
- Stagecoach Great Western Trains Limited (Stagecoach Group plc).

To date, discussions have been held with National Express. Additional initial dialogue has been exchanged with Stagecoach following a request sent through West of England Partnership (on 12<sup>th</sup> September 2012).

No requests for discussion have been received the other TOC bidders (First and Arriva-Deutsche Bahn).

The 2012 DfT pause in the franchising process was called in order to review policy and practice following the discovery of significant flaws in the process for the West Coast inter-city franchise.

It was announced on 31<sup>st</sup> January 2013 by DfT that the Great Western competition referred to above would be cancelled completely. A 28-week extension to the incumbent (First Group) is being granted, with a view to negotiating a full two-year extension of contract. This means that the bidding process is unlikely to recommence until late 2013/early 2014. The shortlisted bidders will be required to pre-qualify again and new discussions may be needed with the eventual shortlisted bidders. In the mean time, any progress towards the implementation of Bristol Metro building up to Autumn 2015 will also need to work additionally with First Group as the incumbent.

### 3.3 Specifications and Assumptions

The original study identified high-level assumptions regarding infrastructure and timings of the existing network, using VoyagerPlan. This provided a quick overview of what service options might be achievable on a remodelled local network. As the proposals progress, it is necessary for a more detailed assessment of the service options, in order to provide more robust proposals for franchise discussions and plans for funding streams. The Bristol Metro Phase 1 proposals for further investigation include:

- An hourly service between Bath and Severn Beach via Bristol Temple Meads and Avonmouth;
- An hourly service between Portishead and Severn Beach via Bristol Temple Meads and Avonmouth; and
- An hourly shuttle service between Portishead and Bristol Temple Meads.

These proposals provide, along with the existing hourly rail service on the Gloucester to Westbury axis, a half-hourly service frequency between Bristol Temple Meads and Bath, Portishead and Severn Beach.

This latest development of the timetable for this has been undertaken using RailSys, a timetable and simulation software used by Network Rail for developing timetables and investigating the impacts of the new infrastructure proposals.

#### 3.3.1 Infrastructure specification

As a result of further investigations, Network Rail has been consulted regarding future proposals for the Bristol area which may affect or facilitate Metro Phase 1 proposals. Therefore in consultation with Network Rail, four infrastructure schemes have been considered during the planning of the Metro services, these include:

- *Preferred Filton Bank four-track option* (provided by Network Rail);
- *Proposed Bristol East Junction* – enhanced renewal option (provided by Network Rail);
- *Revised Portishead Branch* (taken from Network Rail GRIP 3 – October 2010 proposal with extension of double tracking from between Parson Street Junction & Ashton Junction up to a new Clifton Junction nearer the Clifton suspension bridge, as well as a revised junction arrangement at Parson Street); and
- *Bristol Parkway* – provision of an additional platform face as a result of the planned electrification scheme for Great Western lines. It has been assumed to be in place to ease modelling; however the detailed configuration of the wider track layout changes at Stoke Gifford has not been confirmed, and therefore the existing layout has been used within the model, thus providing a less flexible Parkway arrangement than may be expected to be the case once electrification has been completed.

Network Rail's proposals for Filton Bank and Bristol East Junction at the time of modelling can be found in Appendix A.

More detailed information about changes to the network as a result of the electrification proposals has also been received. Specifically these include:

- Layout for four-tracking at Filton Bank;
- Layout at Bristol East Junction; and
- Verbal confirmation of an additional platform face at Bristol Parkway

The working assumptions also included:

- Engineering assumptions for Portishead line as set out in the Network Rail GRIP3 report.

The layout at on Filton Bank comprises four tracks with a 75 mph ladder of turnouts allowing trains to cross at speed from the eastern (nominally fast) tracks to the western (nominally slow) tracks southbound and vice-versa northbound. This contrasts with Halcrow's initial concept that the ability to cross between these lines would be placed in the vicinity of Filton Junction and/or Bristol East Junction. Network Rail's proposal allows this movement to be made at greater speed, enabling routeing of non-stopping trains without them having to be slowed down significantly.

It largely produces the same functionality that Halcrow had originally envisaged to be required but in a different manner, catering to needs that fall outside the scope of Bristol Metro. Operationally speaking it turns the whole stretch of railway between Filton Junction and Bristol East Junction into a super-junction operating dynamically over the length of Filton Bank. The location of the ladder may place constraints on the number and siting of additional stations that might be opened on Filton Bank; while it does not preclude such stations the pathing patterns it creates would also need to be examined in the event of the development of new stations here and any services that would call at them.

As well as the future infrastructure proposals outlined above, the Bristol Metro network has been tested on the existing rail infrastructure.

It should be noted that in the initial study it was identified that there may be a requirement for a turnback facility at Bathampton to facilitate the implementation of Bristol Metro Phase 1. However the proposed rail network has been tested in RailSys without this turnback facility to see if it can be delivered without the infrastructure scheme.

### 3.3.2 Existing service specifications

The table below summarises the existing rail services that form the baseline timetable for the RailSys model:

Rail Service	Frequency
Bristol Temple Meads – Bath - London Paddington (Super Express Train)	2 per hour
(Weston-super-Mare) - Bristol Temple Meads – Bristol Parkway – London Paddington (Super Express Train)	2 per hour (1 per hour to WsM)
Weston-super-Mare – Bristol Parkway	1 per hour
Cross County (Voyager) service terminating/originating at Bristol Temple Meads	1 per hour
Cross County (Voyager) service to/from south-west, via Bristol Temple Meads	1 per hour
Westbury – Gloucester axis (class 15x service)	1 per hour
Taunton – Cardiff (class 15x service)	1 per hour

Rather than model the full Great Western network, a number of boundaries were defined for the RailSys timetables. For example, trains to and from London started or ended their simulated trips at Swindon, Cross Country trains started or ended in Cheltenham, South Wales services appeared on the network at Severn Tunnel Junction and trains to and from the south west appeared at Uphill Junction or Highbridge and Burnham. This provided sufficient geographical coverage to develop the through Bristol rail services, which then provided the base specification on which to overlay the new metro services.

The timetable developed for this assessment is a “standard hour” which represents an off-peak period of the day when the services essentially replicate without variation through the operating period. It does not represent any additional peak services due to higher demand but does give an indication of what could be achieved based on the current service provision and with the inclusion of the new London via Parkway to Bristol services. It does include freight operation though, which is typically higher in the off-peak periods.

The assessment of a “standard hour” timetable is a starting point for average hour modelling. It provides a uniform pattern within the day to assess the network, as well as accounting for freight services which often do not run in peak periods. The normal ‘peak’ level services in the West of England area would also not include an increase in IEP services, as they are proposed to also have a uniform frequency throughout the day. The majority of existing peak rail services use longer trains (i.e. more carriages) to deliver increased capacity, rather than an augmented frequency of services.

### 3.3.3 Metro service specifications

The metro service specification has been assessed as follows:

- A half-hourly service between Severn Beach and Bristol Temple Meads, via Avonmouth;
- An hourly service between Bristol Temple Meads and Bath; and
- A half-hourly service between Bristol Temple Meads and Portishead.

The hourly service to Bath complements existing Gloucester – Westbury axis trains to provide 2 trains per hour between Bristol Temple Meads and Bath.

The line-by-line specifications formed the component parts of the Bristol Metro Phase 1 proposals.

Metro services are assumed to be formed of a 2 car class 150 diesel multiple units (DMU). This is the assumed rolling stock but in practice, the actual service provision would depend on the availability of trains. Class 150 units have a maximum speed of 75 mph so the timings are all based on the performance of this train type; other types would have slightly superior performance capabilities and therefore if substituted would maintain or improve some journey times and/or performance contingency.

### 3.3.4 Freight specification

The freight specification was to maintain:

- One path per hour per direction between Portbury Dock Junction and South Wales; and
- One path per hour per direction between Avonmouth Dock and The Midlands (i.e. via Henbury).

These assumptions are a reasonable future aspiration for freight movements, which over-represent current usage levels, and should be capable of accommodating freight aspirations for the short to medium term. The train characteristics assumed for the freight services were class 66 diesel hauled trains of 1800 tonnes (for loaded train to Portbury) which is representative of trains on this route.

## 3.4 Passenger Timetable

A baseline timetable was developed using the underlying passenger and freight service provision. The basic specification of these services has been outlined in section 3.3 above.

### 3.4.1 Bristol Metro - Planning

The new metro service is a development of the current Bristol to Severn Beach service into a regular two trains per hour (tph) service on this branch providing a significant increase in capacity on the line and also giving a regular, even interval two tph service at Stapleton Road and Lawrence Hill stations on the route between Temple Meads and Narroways Hill Junction.

The new half hourly service is connected at Temple Meads so that one forms a through-service to Portishead and the other reverses in Temple Meads then runs to Bath. This provides the additional Bristol to Bath service at approximately half hourly intervals from the present service which is formed by the Gloucester to Westbury service.

The new Bath service calls at Keynsham and Oldfield Park in both directions and the Severn Beach services are planned as all stations stopping services. The new service to Portishead runs fast from Bristol to the new station at Pill and then on to Portishead. Existing intermediate stations between Temple Meads and Parson Street continue to be served by their current services from Weston-super-Mare.

Portishead is to be served by two trains per hour. One is a continuation of the Severn Beach to Bristol service, and the other at approximately half-hour intervals is provided by a standalone shuttle between Portishead and Temple Meads.

### 3.4.2 Metro Service Pattern

The Severn Beach service departs from this station to Bristol at xx.00 and xx.30 with Bristol arrivals at xx.45 and xx.14 respectively, giving a journey time of approximately 45 minutes. The xx.00 continues to Portishead, departing Temple Meads at xx.56 and arriving at Portishead at xx.17, the following hour. The total journey time including the 11 minutes dwell in Temple Meads is one hour and 17 minutes.

The return working from Portishead departs at xx.22 after a five-minute turn round. The Timetable Planning Rules for the Great Western state that the minimum turn back time for a train is three minutes, so this schedule provides some margin for perturbation recovery while maintaining an efficient use of the rolling stock. The arrival in Temple Meads is at xx.41, thus providing a 19 minutes journey from Portishead. The continuation of this service to Severn Beach departs Temple Meads at xx.46 after a dwell time of five minutes. It arrives in Severn Beach at xx.23 ready to form the xx.30 working for Bath with a turn back time of seven minutes.

The standalone shuttle service to Portishead departs from Temple Meads at xx.22, arriving at Portishead after a stop in Pill at xx.46. This journey is slightly longer than the service originating in Severn Beach because of an operational stop at Clifton Junction to allow a freight train to clear the single line from Portbury Dock towards Parson Street. After a turn round of four minutes in Portishead, the service departs at xx.50 arriving back in Temple Meads at xx.09 on the following hour. The train uses platform 10 in Temple Meads where it waits for 13 minutes before returning to Portishead at xx.22.

The departures from Portishead for Bristol are therefore scheduled for xx.22 and xx.50 giving a 28/32 minutes service interval and departures from Bristol for Portishead are scheduled at xx.22 and xx.55 giving a 33/27 minutes interval in this direction.

The xx.30 departure from Severn Beach turns back in Temple Meads to form the xx.28 departure (in the following hour) to Bath, calling at Keynsham and Oldfield Park before arriving in Bath Spa at xx.45. This gives a total journey time including the turn round time in Temple Meads of 14 minutes, of one hour and 15 minutes.

The xx.45 arrival in Bath terminates in platform 2 where it waits for four minutes before departing as the xx.49 to Temple Meads. This is a quick turn round but is in excess of the TPR three minutes minimum and because of the track layout in Bath Spa, needs to be efficient because there is no provision for stabling a train away from the main running lines at this location.

The initial work undertaken to define a metro service assumed that the DMU would run on to a new turn back facility at Bathampton Junction due to other services running through Bath at the times the new Severn Beach trains needed to run. However, since this original piece of work was conducted, more information has become available about the likely SET timings via Bath and these have permitted the new metro services to fit in and turn round without conflict in Bath station itself.

This offers a considerable improvement over the originally envisaged service because it does not require any additional infrastructure works in the Bath area. The xx.49 departure from Bath arrives in Temple Meads 16 minutes later at xx.05 where it then continues after a reversal to Severn Beach at xx.12. This gives a scheduled turn round time of seven minutes, again, providing a good amount of recovery time in the event of late running. The xx.12 departure arrives in Severn Beach at xx.53, after crossing the xx.00 from Severn Beach at Clifton Down and the xx.30 from Severn Beach at Avonmouth. The xx.53 arrival then waits for seven minutes before forming the next xx.00 departure for Portishead.

It should be noted that the timings for the current stopping services on the Bath to Bristol corridor provide a departure from Bristol at xx.02 and the proposed metro service departs at xx.28. This does not give a precisely half hourly service but does provide two trains per hour at 26 and 34 minutes intervals. Similarly, for the return service from Bath, the current service departs at xx.15 and the new metro service departs at xx.49. This gives the same interval service between Bath departures as the trains in the other direction, namely 26 minutes and 34 minutes. Ideally the service would be exactly at 30 minutes intervals but the routeing and timing of other trains through Bristol prevents this situation from being achievable on the indicative timetable as developed.

Examples to show the standard hour passenger working timetable (nominally 1230-1330) can be found in Appendix B at the end of this report.

### 3.4.3 Minimum turnaround times for Metro services

To support a robust service the ideal situation is to avoid the use of minimum turn round times as specified in the relevant TPR. The following table shows the scheduled minimum turn round times used for the metro services. The minimum TPR values are the standard value for a class 150 DMU.

Location	Minimum TPR Turn Round Time	Minimum Simulated Turn Round Time
Bath Spa	00:03:00	00:04:00
Bristol Temple Meads	00:03:00	00:13:00
Portishead	00:03:00	00:05:00
Severn Beach	00:03:00	00:07:00

As can be seen from the table, the TPR minimums are exceeded in each location where a train turns back. This helps to provide recoverability in the event of service perturbations and delays.

It has been noted that the minimum simulated turn round time for Bath Spa is only one minute over the minimum TPR time; which means there is a potential risk for turnaround at Bath, if there are any delays in the network. Therefore Bathampton junction turn-back facility (retained within capital cost calculations), while not strictly required to deliver the Bristol Metro network, would provide a failsafe for turning Severn Beach to Bath services.

### 3.4.4 Feasibility of proposed layout

The proposed layout reflects the same infrastructure requirements within the initial study, with three alterations/additions; these include:

- Bathampton Junction – no absolute requirement for the turnback loop at Bathampton, capacity is available at Bath Spa Station to turnback services to Severn Beach;
- Bristol East Junction – consultation with Network Rail provided further details on this proposal; and
- Bristol Parkway – additional platform assumed as part of the wider electrification proposals.

The proposed layout at Bristol East Junction is the most important upgrade with respect to the reliable operation of the new metro service; although the four tracking of Filton Bank is also essential to provide more paths between Filton and Bristol, permitting more trains on and off the Severn Beach branch.

However, even though there is a considerable improvement in functionality compared with the current junction layout, Filton Bank still retains some of the more problematic bottle necks. The two requirements assumed for the original development of the Bristol Metro Service was the ability to operate more routes in parallel and the use of four tracks in and out of Bristol from the Filton direction, rather than three.

Parallel operation is very important for junction flexibility and capacity; meaning that trains can take opposing routes simultaneously (generally in opposite directions) without impinging on each other. While a single lead junction by comparison offers no parallel working capability, and a junction margin of three minutes; thus a train using the junction in one direction must only be timed over the conflicting route at least three minutes after the first train has passed the junction. With the arrangement proposed for the approach to Bristol, the interaction between trains at Dr Day's Junction and Bristol East Junction has to be timed with care in order to avoid junction margin infringements.

It was necessary to make a number of attempts to overlay the Metro services onto the layout as proposed and a possible solution was created with judicious retiming of some services and re-platforming of others to permit the Metro service to work.

One advantage of RailSys over traditional timetable planning tools, such as VoyagerPlan or TrainPlan, is that the timetable can be simulated dynamically so all the input trains move around the network responding to the timetable and to signals and possible interactions with other trains, as they would in reality. The simulated timetable developed for about three standard hours showed no delays caused by interactions on any of the key junctions for the service plans outlined.

## 3.5 Summary

The modelling work has now been run on a RailSys simulation package and thus has enhanced rigour over the assumptions in the earlier work.

The timetable developed for this assessment demonstrates that it is possible to operate the Metro service on this layout. Services can be maintained to a robust level

of performance, and would contain contingency at some key points to regain small amounts of time lost, albeit there is an exception to this rule at Bath.

These services constitute a coherent and inter-linked network of cross-Bristol services, with two trains per hour at approximately half-hourly intervals on three key axes. These services would complement other local and regional services to provide an extensive Greater Bristol network.

This pattern of services once established would be operating in what would remain, even after infrastructure enhancements, a busy and complex railway. Therefore adding to the timetabled services on the axes addressed would require potentially significant alterations to other train services in the Bristol area. Should growth be significant however, the strengthening of services by running longer trains would allow additional demand to be accommodated, given that the initial service offer is expected to be worked by only two-car trains.

The overall findings are that the basic half-hourly operation on the three lines of Bristol Metro work effectively.

There are however a number of observations on the layouts provided at BEJ and Filton Bank which would provide greater flexibility in operation of all services through the site by allowing for more parallel movements. These could be made the subject of iterative discussion with Network Rail in order to arrive at the optimum layout for all current plans.

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## 4 Demand Forecasting and Economics

### 4.1 Introduction

After initial work identified a potentially deliverable Greater Bristol Metro, the study has subsequently moved on to refine the analysis of proposals. This included revising demand forecasts to incorporate information released since the first work was done, as well as using industry modelling tools and data previously not available to the study. This section briefly discusses this work.

### 4.2 Demand Methodology

In the initial study the forecasting work undertaken could only make use of readily available data (described below). While these reflected the best available data, the timescales of the study meant it was not possible to use rail industry tools, such as MOIRA2 which allows very detailed assessments of the effect of service changes, or a strategic transport (or rail-specific) model, which would enable detailed assessments of the demand for new stations, in particular the potential for transfer between competing modes of transport.

Subsequently, MOIRA2 has been made available via the DfT for use in assessing the potential changes in demand and revenue, and to provide more details on potential trips and fares to apply to new station forecasts.

#### 4.2.1 Data Sources

##### *MOIRA2*

MOIRA2 is used by the rail industry to forecast the impact of timetables on passenger revenue, including analysing the effect of changes to a timetable such as stopping patterns, infrastructure and rolling stock on the passenger numbers carried and the revenue impact. MOIRA2 is used by all UK passenger train operating companies to assess timetable changes (both planned enhancements and short-term changes such as temporary speed restrictions).

The MOIRA2 system includes the whole of the national rail timetable, though can be run for extracts that align with individual passenger franchise areas. MOIRA2 has been provided to the study team by the DfT for use in this study, incorporating demand and revenue data for the year to Q1 2012 (2011/2012). **Information from MOIRA is provided as commercial in confidence and must not be reported in a disaggregated way that could jeopardise this confidentiality.**

##### *National Rail Travel Survey (NRTS)*

The principal data source used in the initial forecasts was the National Rail Travel Survey (NRTS), which provides estimates of the number of rail trips at stations on a notional and typical day. The values in NRTS are determined from counts of passengers using railway stations at selected points in time. The characteristics of these trips are derived from the results of the survey carried out at the time of the counts and includes origins and destinations of trips using the rail network, both in terms of rail journeys themselves (the first, intermediate and last stations used) and the 'true' origin and destination of trips (including the locations where the overall journey started and finished, such as home, work or other location). Other journey

characteristics derived from NRTS data includes ticket types, journey purposes and journey frequency.

NRTS data has been supplemented by similar information drawn from MOIRA in the revised forecasting process.

#### ***Office of Rail Regulation (ORR) statistics***

The Office of Rail Regulation (ORR) publishes a range of statistics about the rail industry as part of its role as the Regulator for the industry. Information taken from ORR sources included passenger counts at stations and identification of peak passenger conditions at main stations.

Revised ORR station statistics were published in February 2012. These have subsequently been incorporated into the revised forecasts.

#### ***National Rail Enquiries (NRE)***

Publicly quoted fares were extracted from the National Rail Enquiries website for the initial forecasts. This has been superseded by information extracted from MOIRA in the revised forecasts.

#### ***West of England Partnership Rail Survey***

Station patronage figures have been taken from this survey report, along with similar figures derived from NRTS and ORR sources.

#### ***Passenger Demand Forecasting Handbook (PDFH)***

The Passenger Demand Forecasting Handbook (PDFH) is produced by the Passenger Demand Forecasting Council through the Association of Train Operating Companies (ATOC). The PDFH summarises knowledge of the effects of service quality, fares and external factors on rail passenger demand, and provides guidance on applying this knowledge to the preparation of forecasts for investment and service planning. Values in the PDFH can be used to assess demand responses to timetabling and operating decisions.

Note that (like MOIRA) the PDFH contains material that is commercially confidential in nature, and its use is subject to maintaining that confidentiality. As such, no specific details of the information used from PDFH will be included in this Technical Note.

#### ***National Statistics & Tempo***

Population and employment statistics have been taken from National Statistics mid 2010 population estimates and National Statistics Nomis official labour market statistics for 2010 respectively, both at Lower Layer Super Output Area level. Future year planning data has been taken from Tempo.

### **4.2.2 Models**

A series of bespoke spreadsheet models have been developed to assess different aspects of the proposed rail enhancements. These reflect the available data, as discussed above, and consider four main elements, including:

- Trips at new stations (on existing and re-opened lines);
- Changes in demand at existing stations;

- Diversions of existing trips to new stations; and
- Suppression of demand by extra station calls.

### *New Stations*

Forecasting demand at new stations has used a direct demand comparative trip rate approach, with MOIRA2, NRTS, ORR and the WoE Survey data for existing stations as the basis for calculations.

In essence, each new station (whether on a re-opened or existing line) has been aligned with a combination of up to three existing stations. Proxy stations were selected on the basis of similarity to the proposed new station. In particular, 'similarity' has sought to be similar to the geographical location of the new station and the catchment of population and employment around the station. In addition to considering simple population and employment catchments, judgements of the likely spread of passengers' true origins has also been considered, using NRTS data to identify this pattern for existing stations. MOIRA2 figures have been used to identify likely destinations and consequently fares from new stations.

The forecast demand at new stations is based on the relationship between demand at the existing stations and population/employment of the catchment areas, applied to the catchments of the new stations. This is been weighted by a combination of the service level at the proxy stations and population/employment, as well as adjusted to reflect the anticipated service pattern at the new station.

Note that the revenue forecasts are all provided to a 'current' year (notionally 2011 figures), and as such potential future population changes have not been specifically built-into the forecasts. In some particular cases, however, population and/or employment figures have been adjusted to reflect significant new developments, where these are material to the development of the new station in the first place.

### *Diversions of existing trips to new stations*

This has been accomplished using a station choice logit model. The logit model has made use of generalised costs calculated for whole journeys from origin (home in many cases) to destination (for example, work) via the existing station used, which NRTS data identifies as noted earlier, compared with a similar trip using a new station (if appropriate). For practicality, a single binary station choice has been considered for each relevant trip; that is, the existing origin station in the study area used for a trip versus the equivalent journey using the closest new station. MOIRA2 travel patterns have enhanced this assessment from previous analyses.

As mathematical feature of logit functions is that they will always identify a non-zero probability for all of the options being considered; two in the case of a binary logit. This means that, even if one of the options is not realistic, a proportion of people will be forecast to use it. For example, this could happen when the 'nearest' new station is some distance further away from the origin and conveys no overall journey time advantage. Hence, positive weighting has been applied to existing stations in order to minimise the amount of spurious transfers.

### *Changes in demand at existing stations – MOIRA2*

New demand generated at existing stations is an important part of the benefits of the proposals being considered, as new services that call principally (or exclusively) at existing stations make up the main elements of the network enhancements.

The revised forecasts have directly modelled the proposed service changes in MOIRA, thus providing the best possible assessment of the changes at existing stations as a result of the revised services. Note that the modelling algorithms in MOIRA are based on elasticity and other relationships contained in the PDFH.

### *Suppression of demand – MOIRA2*

Where a new station is implemented on an existing line, there is potential to affect demand on services passing through (and stopping) at the new station, as a result of lengthening journey times. This can have a significant effect on revenue if the services to be stopped at a new station are fast and/or long distance, where the journey time penalty is greater and/or fares paid are higher than more local journeys.

Revised forecasts have directly modelled the proposed service changes in MOIRA2, which explicitly includes both positive and negative effects on existing users.

## **4.3 Economics Methodology**

In order to assess the economic benefits of the Greater Bristol Metro using a methodology that is consistent with other schemes that have been assessed in the area, use has been made of the definitive multi-modal modelling tool for the West of England (GBATS) and Government's standard economic assessment tool for transport projects, TUBA (Transport User Benefit Appraisal). Further detailed information on methodology of both tools can be found in Appendix C.

This assessment requires the use of GBATS to allow for mode choice economics to be developed. The full GBATS model was received by Halcrow in August 2012.

GBATS3 is the only available local model that covers all modes; although as a modelling tool for rail, GBATS3 is not particularly strong. Therefore Halcrow have used a combination of the cost functions from within GBATS3 with the revised direct demand models developed. These have then been fed back into the DfT's TUBA (transport users benefits appraisal) tool to calculate scheme economic benefits in the standard format used by the DfT for appraisal (the transport economic efficiency, TEE, table). This process has been iterative with model development, as the demand forecasting is further refined.

The development of the economics of the scheme proposals have been developed into a business case, with more robust financial analysis – with an additional socio-economic assessment element (BCR-NPV). Results are outlined in Section 0 below.

## **4.4 Revenue**

The models outlined above produce changes in rail demand, either based on changes to the journey descriptors such as journey time and service frequency or the catchments potentially captured by a new station. MOIRA2 has been used as much as possible to model revenue changes directly.

New stations have taken fares patterns from relevant proxy stations from MOIRA2, adjusted as appropriate to reflect potentially different fares that could be charged at the new stations. Station-to-station movement-based fares have been used directly as much as possible.

#### 4.5 Forecast Results

Tests have been carried out to understand the potential demand and revenue that could be achieved from implementation of the potential Greater Bristol Metro. In the first instance, forecasts are based on Phases 1 only as described earlier in this report.

Principal forecasts have are expressed as 2011 demand and 2011/12 revenue. In essence, this is because this period's data forms the basis of most background data, and in particular is the basis of the version of MOIRA2 used. As such, the basic forecasts tacitly make the assumption that opening year is the current year, and there is zero residual growth to opening year. This imbues the forecasts with an inherent robustness.

However, to illustrate the potential demand at opening year (2017), the basic forecast has also been adjusted to 2017 demand levels using anticipated growth in the Bristol area as set out in the Great Western RUS (3.2% per annum in the peak, 2.9% per annum off peak from 2008 to 2019 – assuming no significant new rail services). Revenues in this case are expressed in 2011/12 prices. Sensitivity tests remain based on 2011 demand and 2011/12 prices for revenues. Capital costs are in 2012 prices.

Table 4-1 shows summary costs and revenues for the main initial forecasts of Phases 1. This incorporates capital and operating costs also developed as part of the West of England Area Rail Studies, it also compares to the capital and operating costs outlined as part of the initial study.

The initial forecasts suggest that additional revenues (new to the railway) of around £3.8m per annum would be realised with Phase 1 in operation. However, these revenues are off-set against operating costs, resulting in an annual deficit of £1.25m with Phase 1. If anticipated future growth in rail patronage continues to the opening year of the Phase 1 Metro in 2017, this suggests that the revenue deficit could be cut by around £0.4m to £0.8m (revenues expressed in 2011/12 prices).

Table 4-1: Comparison of initial and revised forecasts for Phase 1 - capital and operating costs

Net Changes	Initial Forecast (April 2012)	Revised Forecast (Feb 2013)		Change
	2011/12 demand/revenue	2011/12 demand/revenue	2017 demand/revenue	2011/12 demand/revenue
Capital Cost	£35,660,000	£42,220,000	£42,220,000	+£4,560,000
Additional Revenue	£4,128,092	£3,762,455	£4,185,173	-£365,637
Additional Operating Costs	£5,013,000	£5,013,000	£5,013,000	-
Surplus/ Deficit	-£884,908	-£1,250,545	-£827,826	-£365,637

All costs and revenues are in 2011/12 prices

Detailed notes and assumptions for these forecasts are outlined in Appendix D.

## 4.6 Sensitivity Tests

A series of sensitivities have been carried out to assess the response of forecasts to changes in basic assumptions. These are discussed further below. Appendix D of this report contains detailed station and service results. Note that all sensitivity tests are based on 2011 demand and 2011/12 prices for revenues.

### 4.6.1 Future year forecasts

As the forecasts in this study have utilised current figures, they do not directly take into account patronage growth, which has been significant in recent years on the railway. However, this allows robust assessments to be made, that take a more conservative view, especially if recent growth in the use of rail services continues. Two scenarios have been specifically considered are sensitivity tests:

- Re-based 2016 forecast; and
- Bristol Temple Meads specific growth.

In addition, as outlined earlier in the report, to illustrate the potential demand at opening year (2017), the basic forecast has also been adjusted to 2017 levels using anticipated growth in the Bristol area as set out in the Great Western RUS (3.2% per annum in the peak, 2.9% per annum off peak from 2008 to 2019 – assuming no significant new rail services).

#### *2016 forecast*

A forecast of overall rail travel has been carried out, based on two sources of growth information. In the first instance, this included using 2016 Temprow forecasts of populations within station catchments (of existing and proposed stations) to factor demand. This is a fairly blunt geographic assessment, as Temprow figures are not provided at a particularly disaggregated level.

In addition, it is arguable that population changes have thus far not been responsible for significant observed increases in rail travel, which have been much higher than any population changes. Hence a second source forecast has sought to extrapolate recent growth (from 2004/05 to 2010/11) observed in ORR station usage data. This has been localised to individual stations, but taking a non-linear approach that conservatively reflects future growth prospects rather than simply assuming continuation of a 5/6 year pattern. An average of the two forecasts is provided as a middle ground 2016 forecast.

Table 4-2 shows summary costs and revenues for 2016 forecasts. The Temprow forecast does not predict significant changes in population, and hence rail travel and revenue.

As such, the operating deficit does reduce, but by less than £0.2m to £1.07m per annum.<sup>1</sup> With recent growth in rail travel of over 40% over the last 5/6 years (over 6% per annum), it is unsurprising that a forecast based on a slightly reduced continuation of this sort of trend still results in large increases in demand. This predicts an increase in revenue of some £0.84m per annum, thus reducing the operating deficit to £0.4m. Taking an average of these gives an operating deficit of £0.76m per annum.

Table 4-2: Summary of costs and revenues for 2016 forecasts

Net Changes	Phase 1 all elements 2011	Phase 1 + 2016 forecast Tempro	Phase 1 + 2016 forecast ORR growth	Phase 1 + 2016 forecast AVERAGE
Capital Cost	£42,220,000	£42,220,000	£42,220,000	£42,220,000
Additional Revenue	£3,762,455	£3,938,887	£4,597,994	£4,252,398
Additional Op Cost	£5,013,000	£5,013,000	£5,013,000	£5,013,000
Surplus/Deficit	-£1,250,545	-£1,074,113	-£415,006	-£760,602

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

Detailed notes and assumptions for these forecasts are outlined in 6.4Appendix D.

#### ***Bristol Temple Meads – Enterprise Zone***

Additional demand is likely to be generated at Bristol Temple Meads as a result of the Temple Quarter Enterprise Zone, which is seeking to deliver up to 17,000 new jobs in the immediate vicinity of the station. As a relatively new initiative, the Enterprise Zone is not fully represented in future year planning horizons given by Tempro (at present). Details of the amount and type of rail use that could be generated by the Enterprise Zone are yet to be determined. A growth in base passenger throughput at Bristol Temple Meads of 25% has been assumed in this sensitivity test, and Phase 1 Greater Bristol Metro services applied to this.

Additional development in the vicinity of Bristol Temple Meads on this sort of scale would have a significant effect on base demand and revenue even before the Greater Bristol Metro is in place (albeit that the ability to carry such demand may be difficult to achieve). It would also have a positive effect on patronage and hence revenues for the Metro itself, potentially increasing Phase 1 revenue by almost £0.2m and reducing the Phase 1 Greater Bristol Metro operating deficit to £1.03m per annum. Table 4-3 shows summary costs and revenues for the Enterprise Zone sensitivity test.

<sup>1</sup> Note that capital costs are 2012 Q1 prices, revenue figures are 2011/12 prices (year to Mar 2012).

Table 4-3: Summary of costs and revenues for EZ sensitivity test

Net Changes	Phase 1 (all elements)	Phase 1 + increased BTM growth (EZ)	Phase 1 + released BTM suppressed trips
Capital Cost	£35,660,000	£35,660,000	£35,660,000
Additional Revenue	£3,762,455	£3,975,716	£3,851,260
Additional Op Costs	£5,013,000	£5,013,000	£5,013,000
Surplus/ Deficit	-£1,250,545	£1,037,284	£1,161,740

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

Detailed notes and assumptions for these forecasts are outlined in 6.4 Appendix D.

### *Latent demand*

In common with a many large urban areas outside London, Bristol has seen significant increases in rail trips entering/leaving the city in the morning and evening peak periods. As train service capacity has not necessarily expanded at a similar rate, there is a degree of overcrowding.

Hence, it can be argued that there is a degree of latent demand for rail services into Bristol. The amount of latent demand can be broadly estimated using the degree of crowding in these figures using techniques suggested in the PDFH. This results in an estimated suppression or latent demand of some 5.8% of trips at Temple Meads.

As such, a sensitivity test has been carried out, using a similar technique to that used to consider the Temple Quarter Enterprise Zone, which estimates the effect on demand and revenues. Table 4-3 also shows the results of the latent demand analysis. The increased revenue in the base situation results in a reduction in the operating deficits in Phase 1 of just under £0.1m, to £1.16m per annum.

## 4.6.2 Fares

### *Local area fare increases*

Forecasts in this study assume current fare levels are maintained. This sensitivity test considers the situation where fares are increased in real terms. The potential demand response to higher fares has been modelled using MOIRA2. Three tests have been carried out, with the following assumptions:

- 2% increase in fares in the Bristol region of the Great Western franchise;
- 5% increase in fares in the Bristol region of the Great Western franchise; and
- 10% increase in fares in the Bristol region of the Great Western franchise.

Note that the fare increase assumptions modelled using MOIRA2 are more aggregated than the sensitivity tests carried out in the previous study. An alternative method looking more closely at fare levels from particular stations on the Severn Beach Line is discussed below.

It is not possible to model changes individual station-to-station fares using MOIRA2, or to change fares from one station (or a small group of stations) to all other stations.

Regional changes are allowed, based on sub-areas within franchise areas rather than specifically identifiable groups of stations.

However, the modelling within MOIRA2 of the effects of changing fares is far more sophisticated, in that it allows analysis of the effects of fare changes on different types of tickets, such as the propensity to change to lower/higher price tickets as well as simply change demand as a result of fares changes. Previous work could only use aggregated and average fares, with a single elasticity applied that was an average based on broad location. This resulted in increases in revenue as fares rose.

Table 4-4 shows summary costs and revenues for sensitivity tests where fares have been assumed to be higher in real terms than current values. This sensitivity test indicates that increasing fares would reduce revenue overall and thus increase annual deficits. A 2% increase in fares in the Bristol region of the Great Western franchise area increases the deficit to £1.45m per annum, a 5% increase to £1.61m and 10% to £1.93m.

Table 4-4: Summary of costs and revenues for local fares sensitivity test

Net Changes	Phase 1 all elements	Phase 1 + increased fares by 2%	Phase 1 + increased fares by 5%	Phase 1 + increased fares by 10%
Capital Cost	£42,220,000	£42,220,000	£42,220,000	£42,220,000
Additional Revenue	£3,762,455	£3,578,412	£3,398,441	£3,086,088
Additional Op Cost	£5,013,000	£5,013,000	£5,013,000	£5,013,000
Surplus/Deficit	-£1,250,545	-£1,434,588	-£1,614,559	-£1,926,912

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

Detailed notes and assumptions for these forecasts are outlined 6.4Appendix D.

The principal reason that revenue decreases as prices rise is that the greatest effects are noted on the use of full-price ticket types, which have the elasticities of revenue to demand which are less than -1.

As such, the increase in fare reduces demand to the extent that it more than off-sets the increased ticket price per remaining traveller. Other ticket types, such as reduced price tickets, advance tickets and seasons are actually modelled to have an increase in demand and revenue using these tickets as a result of transfers from full-price tickets, but full price tickets have the dominant effect in reducing revenue overall.

#### *Targeted fare increases – Severn Beach Line*

It is widely considered that local fares for travel on the Severn Beach line are low in comparison with equivalent fares elsewhere, both locally and further a-field. As such, a second targeted sensitivity test has considered the situation where fares for journeys between Severn Beach line stations and other stations in the local study area (only) are increased.

As noted above, it has not been possible to use MOIRA2 to do this assessment directly, so a bespoke sub-model has been constructed using data derived from MOIRA2 relating to journeys and fares, including use of different ticket types.

Increased fares for Severn Beach line local journeys have been used to generate changes to demand and revenue for trips between Severn Beach line stations and other stations in the study area, based on elasticities from the PDFH. Different elasticities applied according to journey type and distance. No effect has been included for increased fares for trips between Severn Beach line stations and the Portishead line, as this would require significant assumptions about the journeys undertaken by Portishead line users (Portishead line revenues are unchanged from Phase 1). As such, these sensitivity tests can be considered very slightly conservative on revenue from increasing fares on the Severn Beach line.

Three main scenarios have been modelled:

- £0.25 increase in average one-way fare;
- £0.50 increase; and
- £1.00 increase.

In addition, a £2.00 increase in one-way fares has been considered. This is not reported in the table of fare sensitivity tests, and is included for indicative purposes only. Care should be taken in using the elasticity approach with changes to fares that are comparatively large.

Elasticities that predict increasing revenue with increasing fares will inexorably do so as fares rise, even though demand is forced lower and lower, ultimately becoming unrealistic. However, the point at which it does so will vary according to circumstances, and is not readily identifiable. While £2.00 may not be a significant sum of money, this represents an almost doubling of some of the fares that this is applied to. It could be contended that results of the £1.00 change to fares should also be considered accordingly.

The effects on revenue are shown in Table 4-5, with detailed notes and assumptions for these forecasts are outlined in 6.4 Appendix D.

Table 4-5: Effects on revenues for targeted increase in fares on Severn Beach Line

Net Changes	Phase 1 all elements	Phase 1 + increased SBL fares by £0.25	Phase 1 + increased SBL fares by £0.50	Phase 1 + increased SBL fares by £1.00
Capital Cost	£42,220,000	£42,220,000	£42,220,000	£42,220,000
Additional Revenue	£3,762,455	£3,810,423	£3,851,779	£3,922,010
Additional Op Cost	£5,013,000	£5,013,000	£5,013,000	£5,013,000
Surplus/Deficit	-£1,250,545	-£1,202,577	-£1,161,221	-£1,090,990

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

This indicates that revenues would increase and operating deficits decrease in all scenarios, albeit that demand for local Severn Beach line journeys is reduced. With a £0.25 increase in Severn Beach Line local journey fares, the operating deficit could decrease by almost £50,000 to £1.20m (local trips reduce by 15%). A £0.50 increase raises revenue by just almost £90,000, reducing the deficit to £1.16m.

Finally, a £1.00 increase for local Severn Beach line journeys lifts revenues by almost £160,000 and deficit is reduced to £1.09m (local trips reduce by over 35%). The indicative £2.00 increase in one-way fares could result in additional revenue of £0.27m, reducing the deficit to £0.98m. However, the modelling approach taken indicates that this reduces demand to/from Severn Beach stations by more than 50% compared to the initial Phase 1 forecasts.

### 4.6.3 Operating cost sensitivity

Estimates of operating costs are relatively high level. As such, it is instructive to consider potential situations where operating costs may be higher or lower than the basic forecast. A series of sensitivities have been prepared, varying operating costs as follows:

- Increase by 5%, 10% and 15%; and
- Reduce by 5%, 10% and 15%.

The results of these tests are shown in Table 4-6 and Demand at 2011 levels, all costs and revenues are at 2011/12 prices

Table 4-7, with detailed notes and assumptions for these forecasts are outlined in 6.4 Appendix D.

Table 4-6: Effects of operating cost sensitivities on revenues - increases

Net Changes	Phase 1 all elements	Phase 1 + op costs +5%	Phase 1 + op costs +10%	Phase 1 + op costs +15%
Capital Cost	£42,220,000	£42,220,000	£42,220,000	£42,220,000
Additional Revenue	£3,762,455	£3,762,455	£3,762,455	£3,762,455
Additional Op Cost	£5,013,000	£5,263,650	£5,514,300	£5,764,950
Surplus/Deficit	-£1,250,545	-£1,501,195	-£1,751,845	-£2,002,495

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

Table 4-7: Effects of operating cost sensitivities on revenues - decreases

Net Changes	Phase 1 all elements	Phase 1 + op costs -5%	Phase 1 + op costs -10%	Phase 1 + op costs -15%
Capital Cost	£42,220,000	£42,220,000	£42,220,000	£42,220,000
Additional Revenue	£3,762,455	£3,762,455	£3,762,455	£3,762,455
Additional Op Cost	£5,013,000	£4,762,350	£4,511,700	£4,261,050
Surplus/Deficit	-£1,250,545	-£999,895	-£749,245	-£498,595

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

Increasing operating costs also increase the operating deficit, to £1.5m with a 5% increase in costs, rising further to £2m with a 15% increase. Conversely, reducing operating costs has the potential to reduce the deficit, to just under £1m with a 5%

reduction in costs, falling further to £0.5m if costs could be cut by 15% from the initial estimate.

#### 4.6.4 Combined scenario sensitivity test

To further illustrate the range of potential demand, a sensitivity test has been carried out that incorporates some of the other sensitivity test assumptions into a single combined scenario that reflects an optimistic assessment of potential demand and revenue. This combined scenario includes:

- Increase in demand at Bristol Temple Meads as a result of Enterprise Zone developments around the station and releasing suppressed demand,<sup>2</sup> and
- Increase fares between Severn Beach line stations and other stations in the local study area – taking the central sensitivity case described above with an additional 50p added to fares.

Table 4-8 shows the results of this combined scenario sensitivity test, which suggest that the operating deficit for the Greater Bristol Metro could be reduced to £0.95m in Phase 1. Detailed notes and assumptions for these forecasts are outlined in 6.4 Appendix D.

Table 4-8: Combined scenario sensitivity test

Net Changes	Phase 1 all elements	Phase 1 + combined sensitivity test
Capital Cost	£42,220,000	£42,220,000
Additional Revenue	£3,762,455	£4,067,746
Additional Op Cost	£5,013,000	£5,013,000
Surplus/Deficit	-£1,250,545	-£945,254

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

#### 4.6.5 Best case scenario

As an indication of the range of potential revenue situations that the Greater Bristol Metro could result in through Phase 1, a further sensitivity scenario brings together some other elements that could affect the overall operating deficit. This includes:

- The combined scenario described above;
- A 10% reduction in the estimate of operating cost; and

<sup>2</sup> This has assumed an increase in base demand through Bristol Temple Meads of 25%. This has taken the conservative approach of not added an additional element for suppression of demand at Temple Meads to the changes assumed related to full build-out of the Enterprise Zone.

- Incorporating potential background growth in rail use to 2016 (possible opening year) levels. This is based on the future year sensitivity tests described earlier in this technical note, and assumes an increase in demand and revenue of 10%.

Table 4-9 shows the results of this test. In essence, if all the features of the combined scenario (build-out of the Enterprise Zone and Severn Beach line fare rises) can be accomplished alongside 10% lower operating costs than initially estimated, and growth in rail travel continues to grow as it has in recent years, then the Greater Bristol Metro could almost cover its operating costs from fares. This 'best case' scenario has an operating deficit of £0.04m.

Table 4-9: "Best-case" scenario sensitivity test

Net Changes	Phase 1 all elements	Phase 1 + 2016 combined sensitivity test
Capital Cost	£42,220,000	£42,220,000
Additional Revenue	£3,762,455	£4,474,520
Additional Op Cost	£5,013,000	£4,511,700
Surplus/Deficit	-£1,250,545	-£37,180

Demand at 2011 levels, all costs and revenues are at 2011/12 prices

## 4.7 Economic Results

### 4.7.1 BCR

Summary results of TUBA assessments of Phase 1 of the Greater Bristol Metro are shown in Table 4-10 (full results are shown in Appendix E). This sets out the Analysis of Monetised Costs and Benefits (AMCB) of the scheme.

Overall, benefits outweigh costs, and the Greater Bristol Metro Phase 1's benefit to cost ratio (BCR) at this stage of its development is **2.51**. Most benefits are drawn from travel time savings. It should be noted that all entries are present values discounted to 2010, in 2010 prices

Table 4-10: Greater Bristol Metro Phase 1 – Analysis of Monetised Costs and Benefits

Greenhouse Gases	2,006
Economic Efficiency: Consumer Users (Commuting)*	151,638
Economic Efficiency: Consumer Users (Other)	77,692
Economic Efficiency: Business Users and Providers	119,550
Wider Public Finances (Indirect Taxation Revenues)	-1,351
Present Value of Benefits (PVB)	349,537
Broad Transport Budget	138,993
Present Value of Costs (PVC)	138,993

Net Present Value (NPV)	210,544
<b>Benefit to Cost Ratio (BCR)</b>	<b>2.51</b>

All entries are present values discounted to 2010, in 2010 prices

\* Note that the breakdown of benefits for 'commuting' and 'other' journey purposes is arbitrary; as these purposes have been combined in the assessment of car users' benefits (results are included in 'commuting')

#### 4.7.2 Capital cost sensitivity tests

Table 4-11 shows summary ACMB results of the TUBA assessments of capital cost sensitivity tests (full results are shown in Appendix E).

Increasing capital costs obviously reduces overall net present value (NPV) and BCR of the scheme, the greater the increase in cost, the greater the reduction in NPV and BCR. For instance, if costs are 10% higher than currently anticipated (for example, if more infrastructure turned out to be needed on the Portishead line) the BCR drops from 2.51 to 2.38. Likewise, a 20% increase reduces BCR to 2.25, a 30% increase to 2.14 and a 50% increase in costs would reduce the BCR to below 2, at 1.95.

Table 4-11: Greater Bristol Metro Phase 1 – Analysis of Monetised Costs and Benefits – capital cost sensitivity tests

	Capital cost increased by...			
	+10%	+20%	+30%	+50%
Greenhouse Gases	2,006	2,006	2,006	2,006
Economic Efficiency: Consumer Users (Commuting)	151,638	151,638	151,638	151,638
Economic Efficiency: Consumer Users (Other)	77,692	77,692	77,692	77,692
Economic Efficiency: Business Users and Providers	119,550	119,550	119,550	119,550
Wider Public Finances (Indirect Taxation Revenues)	-1,351	-1,351	-1,351	-1,351
Present Value of Benefits (PVB)	349,537	349,537	349,537	349,537
Broad Transport Budget	147,107	155,221	163,335	179,563
Present Value of Costs (PVC)	147,107	155,221	163,335	179,563
Net Present Value (NPV)	202,430	194,316	186,202	169,974
Benefit to Cost Ratio (BCR)	2.38	2.25	2.14	1.95

All entries are present values discounted to 2010, in 2010 prices.

\* Note that the breakdown of benefits for 'commuting' and 'other' journey purposes is arbitrary; as these purposes have been combined in the assessment of car users' benefits (results are included in 'commuting')

## 4.8 Summary

This section has revised the demand and revenue forecasts and developed the socio-economic case for the scheme. The revisions have focussed on adding rigour to the analysis through the use of industry revenue analysis tools MOIRA2 and the regional transport model GBATS, as well as more up to date information on base rail demand.

The MOIRA2 model in particular has added rigour on ticket yield, and well as competitive responses to the proposals from within the rail industry. The key findings are:

- The central case operating subsidy requirement is around £1.2m per annum;
- Sensitivity analysis suggests this figure can vary from break-even to a loss of around £1.5m;
- Key sensitivity factors are levels of growth in the early years, and assumptions of scheme operating costs; and
- The economic case for the scheme appears strong – the central case estimate is 2.5.

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## 5 Economic Development Impacts

### 5.1 Introduction

In December 2012, Atkins<sup>3</sup> produced a report on behalf of the West of England Partnership outlining the GVA impacts of major transport schemes in the West of England, which includes the Bristol Metro Network Proposals for Phase 1 and 2, as well as the New Stations Package.

### 5.2 Key findings for impact of Bristol Metro Proposals on West of England GVA

Atkins used scheme assumptions from the initial Halcrow West of England Rail Studies report (April 2012) to develop their assessment of impacts. These assumptions are:

Phase 1 services include:

- Portishead to Bristol Temple Meads
- Portishead to Severn Beach
- Bath to Severn Beach

Phase 2 services include:

- Henbury
- Weston-Super-Mare to Yate enhancement

New Stations Package includes:

- Saltford
- Corsham

The results of the Atkins impact assessment

Scheme	Forecast Outturn Cost (£m)	Present Value of Costs (£m)	Increase in GVA (2030) (£)	Increase in GVA per Unit Cost
Rail schemes (Metro, New Stations)	£91m*	£77m*	£153m	2.0

\* Initial estimates of costs for rail schemes and Temple Quarter Transport Package, to be confirmed following further study

For more information, please refer to the original Atkins report.

<sup>3</sup> <http://www.westofenglandlep.co.uk/assets/files/Transport%20and%20Infrastructure/GVA%20impacts%20in%20WoE%20-%20final.pdf>

## 6 Consideration of Wider Regional Linkages

### 6.1 Introduction

The core operational ethos of Greater Bristol Metro is a 30 minute interval service on three main suburban links into Bristol Temple Meads. The geographical limits the services focus on Temple Meads, with definitive termini at Portishead and Severn Beach and other turnaround points at logical operational locations close to the edge of the West of England area (Bath, Yate and Weston Super Mare).

It has been suggested that services should continue beyond these points to provide additional journey opportunities for travellers from further afield. For example, the Severn Beach – Bath Spa service could operate to/from Westbury instead of Bath.

Any service extensions would clearly have operating cost implications, with additional route mileage and running time leading to increased fuel use and track access charges, and in turn is also likely to require more train units and staff to operate the extended service.

This section of the report will briefly outline the feasibility of such locations, as well as identifying the revenue potential of these wider linkages. It should be noted that the analysis is high-level and does not contain the same rigour as the demand and operational assessments undertaken in other parts of this report.

### 6.2 Wider area revenue potential

#### *Additional revenue at stations*

This section considers the potential revenue implications of running services beyond the proposed Greater Bristol Metro extent. This has looked at extending services to potentially include station stops at:

- Avoncliff;
- Bradford-on-Avon;
- Bridgwater;
- Bruton;
- Cam & Dursley
- Castle Cary;
- Dilton Marsh;
- Freshford;
- Frome;
- Highbridge & Burnham;
- Trowbridge;
- Warminster; and
- Westbury.

In order to give an indication of the likely additional revenue from extending services, reference has been made to the effects on the revenue at stations that are served by the Phase 1 Greater Bristol Metro. This has considered the proportions of 'local' trips to/from the Greater Bristol area at stations listed above, as well as at stations in the area itself – information pertaining to this can be extracted from NRTS data previously provided to the study team.

The proportions of 'local' trips have been increased at the extended area stations using factors derived from changes in demand modelled at stations served by the Greater Bristol Metro, as far as possible comparing using weighting factors to reflect similar stations and situations.

The possible effects on revenue individual stations have been determined firstly by estimating an initial revenue from assumed average fares for 'local' trips (based on average fares at nearby stations), and increasing this using the demand factors derived from 'local' trips. The tacit assumption in these estimates is one additional service per hour by extending an appropriate Greater Bristol Metro service in Phase 1 as appropriate. Potential revenue increases (2011 values per annum) at the stations identified previously are shown below:

Station	Revenue	Station	Revenue
Avoncliff	£10,000	Frome	£50,000
Bradford-on-Avon	£70,000	Gloucester	£70,000
Bridgwater	£60,000	Highbridge & Burnham	£40,000
Bruton	£20,000	Taunton	£100,000
Cam & Dursley	£60,000	Trowbridge	£90,000
Castle Cary	£20,000	Warminster	£40,000
Dilton Marsh	£10,000	Westbury	£70,000
Freshford	£10,000		

#### *Additional revenue for services*

Combining individual station figures gives estimates of total potential revenue that various options for extended services could achieve. Additional revenue has also been added for Salisbury, Frome and Castle Cary as appropriate, in turn based on patronage and revenue effects at Bath Spa and Bristol Temple Meads modelled in Phase 1. Potential revenues for station combinations and 'terminating at...' extended service options are shown below:

Terminating at...	Revenue	Station
Westbury	£250,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge
Taunton	£200,000	Highbridge & Burnham, Bridgwater
Salisbury	£300,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge, Westbury, Dilton Marsh, Warminster
Gloucester	£130,000	Cam & Dursley
Frome	£300,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge, Westbury

Terminating at...	Revenue	Station
Castle Cary	£340,000	Freshford, Avoncliff, Bradford-on-Avon, Trowbridge, Westbury, Frome, Bruton

Revenues are 2011 values per annum

Further work would be required to refine any potential extended service options further, in particular to assess them within the MOIRA2 model.

## 6.3 Operational Feasibility

### 6.3.1 Wiltshire/Somerset

Using the example of a Bath Spa to Westbury extension, the additional time taken for a train to run to Westbury and return is at least one hour including turnaround time. Subsequently the hourly Severn Beach – Bath Spa service would require at least one additional two-car diesel unit and associated staff to maintain the level of service whilst extending to Westbury.

Operating costs estimated for the Severn Beach – Bath Spa service were £1.55m per annum (West of England Rail Studies Final Report, April 2012), which covered one additional unit being added to the existing Severn Beach – Bristol Temple Meads service. Additional operating costs for the extension of this service to Westbury are estimated to be around £0.8m per annum; therefore the level of demand and subsequent potential additional revenue (£250,000 per annum) is not sufficient to cover the additional operating cost and would require a further subsidy of approximately £0.55m per annum.

All other potential locations in Wiltshire/Somerset identified above would require additional units and staffing considerations to those assumed for Westbury extension, increasing the operating costs further without sufficient extra demand and revenue potential (maximum potential revenue £340,000 per annum, extending to Castle Cary). Further work would be required to consider in greater detail the operational implications and costs of extending services in the Greater Bristol Metro.

### 6.3.2 Gloucester/Taunton/South-West

In principle the pathing capacity already exists to start existing Weston-super-Mare to Bristol Parkway services at Taunton, or potentially Exeter. The current First Great Western (FGW) timetable already makes use of this routing for peak services. Therefore the additional cost would be based on:

- additional operational mileage; and
- additional rolling stock leasing

The requirement for additional rolling stock leasing, needs to take account of the current timetable arrangements of FGW local and regional services. These strongly suggest a timetable driven by utilising the available rolling stock as efficiently as possible, rather than identifying routes and specific route-by-route rolling stock requirements. This means that rolling stock is not in practice dedicated to any specific group of services, with any high level calculation of additional requirement needing to deal in equivalent additional resources, rather than actuals. Nevertheless this approach can give a good indication of what the additional resource requirement should be.

Calculations assume services operating equivalent to a six day operating week (i.e. the sixth day equals weekday but is assumed to be reduced over Saturday and Sunday). There are assumed to be 51 operating weeks in the year to account for Bank Holiday weekend closures.

To extend all services beyond Weston-super-Mare to Taunton would generate additional running time (and therefore crew hours). Operating costs would be approximately £0.5m per annum of which around 45% would be rolling stock leasing. The subsequent potential additional revenue available from extending this service amounts to approximately £200,000 per annum; however this leaves a shortfall of £0.3m per annum requiring subsidy.

To extend services to Gloucester, operating costs would be approximately £0.8m per annum, of which 40% is comprised of rolling stock leasing. With potential additional revenues amounting to approximately £130,000 per annum, this extension would require continued a subsidy of £0.67m per annum.

## 6.4 Summary

This high level analysis of the potential to link the wider catchment of the WoE has shown that:

- There is operational scope to extend service towards and beyond Westbury, as well as to Taunton and Gloucester;
- In extending services, additional rolling stock will be required; and
- High level revenue forecasts suggest that the operating costs of these service extensions are likely to outstrip additional revenue by a significant degree. Such services are therefore not likely to be viable without significant subsidy.

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## Appendix A

Network Rail's GRIP 2 Proposal – Bristol East  
Junction (Option 1)

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**Appendix A      Network Rail's GRIP 2 Proposal – Bristol  
East Junction (Option 1)**

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## Appendix B

Bristol Metro Proposals - Indicative Standard Hour  
Timetable

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## **Appendix B Bristol Metro Proposals – Indicative Standard Hour Timetable**

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Table B-1 Severn Beach and Bristol Parkway - Portishead

From	Dep/ Arr	Gloucester	Severn Beach	The North East	London Paddington	Cardiff	The North East	Severn Beach	London Paddington	Cardiff	Temple Meads	Bristol Parkway
Bristol Parkway	D	12:23		12:28	12:38		12:56		13:08			13:12
Filton Abbey Wood	D	12:27				12:47				13:11		13:16
Severn Beach	D		12:00					12:30				
St. Andrews Road	D		12:07					12:37				
Avonmouth	D		12:12					12:42				
Shirehampton	D		12:15					12:46				
Sea Mills	D		12:19					12:50				
Clifton Down	D		12:28					13:00				
Redland	D		12:30					13:03				
Montpelier	D		12:32					13:05				
Stapleton Road	D		12:39					13:09				
Lawrence Hill	D		12:41					13:11				
Bristol Temple Meads	A	12:36	12:45	12:41	12:48	12:58	13:08	13:14	13:17	13:21	13:22	13:24
Bristol Temple Meads	D	12:54	12:56	12:44	12:52	13:00		13:28		13:25		13:26
Bedminster	D											13:29
Parson Street	D											13:32
Pill	D		13:12								13:41	
Portishead	A		13:17								13:46	
To		Bristol Temple Meads	Portis- head	The South West	Weston- Super-Mare	Taunton	Bristol Temple Meads	Bath	Bristol Temple Meads	Ports- mouth	Portis- head	Weston- Super- Mare

Table B-2 Portishead – Bristol Parkway and Severn Beach

From	Dep /Arr	Bristol Temple Meads	Westbury	Weston-Super-Mare	Portishead	Portsmouth	Bristol Temple Meads	Weston-Super-Mare	Portishead	Bath	Taunton	The South West
Portishead	D				12:22				12:50			
Pill	D				12:27				12:55			
Parson Street	D			12:32								
Bedminster	D			12:34								
Bristol Temple Meads	A		12:33	12:37	12:41	12:42		13:03	13:09	13:05	13:13	13:21
Bristol Temple Meads	D	12:37	12:38	12:40	12:46	12:48	12:59	13:06		13:12	13:17	13:27
Lawrence Hill	D			12:43	12:49					13:15		
Stapleton Road	D			12:46	12:52					13:17		
Montpelier	D				12:56					13:23		
Redland	D				12:57					13:25		
Clifton Down	D				13:00					13:28		
Sea Mills	D				13:04					13:34		
Shirehampton	D				13:08					13:37		
Avonmouth	D				13:13					13:42		
St. Andrews Road	D				13:16					13:46		
Severn Beach	A				13:23					13:53		
Ashley Hill												
Filton Abbey Wood	A		12:49	12:53		12:57					13:27	
Filton Abbey Wood	D		12:50	12:54		12:58					13:28	
Bristol Parkway	A	12:46	12:54	13:00			13:08	13:16				13:35
To		London Paddington	Gloucester	Bristol Parkway	Severn Beach	Cardiff	The North East	London Paddington	Bristol Temple Meads	Severn Beach	Cardiff	The North East

Table B-3 Bath Spa – Bristol Temple Meads

From		Westbury	Portsmouth	London Paddington	Bath Spa	London Paddington
Bath Spa	(dep.)	12:15	12:29	12:33	12:49	13:04
Oldfield Park	(dep.)	12:18			12:51	
Keynsham	(dep.)	12:25			12:59	
Bristol Temple Meads	(arr.)	12:33	12:42	12:45	13:05	13:15
Bristol Temple Meads	(dep.)	12:38	12:48		13:12	
<b>To</b>		<b>Gloucester</b>	<b>Cardiff</b>	<b>Bristol Temple Meads</b>	<b>Severn Beach</b>	<b>Bristol Temple Meads</b>

Table B-4 Bristol Temple Meads – Bath Spa

From		Bristol Temple Meads	Gloucester	Bristol Temple Meads	Cardiff	Severn Beach
Bristol Temple Meads	(arr.)		12:36		13:21	13:14
Bristol Temple Meads	(dep.)	12:50	12:54	13:20	13:25	13:28
Keynsham	(dep.)		13:02			13:36
Oldfield Park	(dep.)		13:09			13:43
Bath Spa	(arr.)	13:01	13:11	13:31	13:36	13:45
<b>To</b>		<b>London Paddington</b>	<b>Westbury</b>	<b>London Paddington</b>	<b>Portsmouth</b>	<b>Bath Spa</b>

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# Appendix C

Economics Methodology

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## Appendix C Economics Methodology

### *GBATS*

GBATS has been used to model the Greater Bristol Metro by the addition of new rail stations and rail services for both the 2016 and 2031 model years, tacitly assuming that the Metro would be operational from an opening year of 2016. The 'do minimum' scenario upon which assessments of the Greater Bristol Metro have been based was advised by Bristol City Council's modelling team, and includes implementation of the 'major schemes' anticipated in the Bristol area (such as the three BRT routes currently being implemented).

### *TUBA*

TUBA (Transport User Benefit Appraisal) is transport economic appraisal software, originally developed by Mott MacDonald for the Department for Transport (DfT), that is used to carry out economic appraisal in accordance with the DfT's guidance published in Units 3.5 of WebTAG<sup>4</sup>. TUBA takes a 'willingness to pay' approach to economic appraisal for multi-modal schemes with fixed or variable demand.

Results from GBATS modelling have been fed into TUBA. A full GBATS run produces (hundreds of) matrix files for input to TUBA, which include matrices of trips and journey data (time, cost and distance). GBATS model runs produce results for three time periods (AM peak, inter-peak and PM peak hours) and several modes (car, bus, rail and BRT), also subdivided further by user class (including commuting, other home based trips and business journeys) and the income level of travellers. TUBA makes use of these disaggregated results to calculate costs and benefits to users. On a technical level, GBATS outputs are post-processed to convert into formats that TUBA can use. This also adjusts trips and costs to ensure no double counting of car and bus trips using of park & ride.

The principal output from TUBA is the 'Economic Efficiency of the Transport System' table (TEE table). This includes costs and benefits such as travel time, vehicle operating costs, user charges, capital and operating costs and grants/subsidies, across different groups (including commuters, other travellers, business and the public sector). The 'Effects on the Public Accounts' table reports forecast changes in local and central government costs and tax revenues. Finally, the 'Analysis of Monetised

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<sup>4</sup> Note that initial economic analysis of the Greater Bristol Metro used TUBA version 1.8 (released in April 2011), as this was the current version when work commenced. Subsequently, an updated version 1.9 has been released (October 2012). As well as updating various economic parameters, a significant change that this version introduces is to alter the evaluation year to 2010 (from 2002). Version 1.9 has been used for the analyses reported in this Technical Note.

Costs and Benefits' (AMCB) brings together all costs and benefits, summarising results as a net present value (NPV) and benefit-cost ratio (BRC).

### *Adjustments to GBATS model results*

The initial expectation in this study was that the quantum of change forecast by GBATS was likely to be much less than 'direct demand' forecasts of station usage obtained from MOIRA2<sup>5</sup> and the new station forecast models. Therefore, the intention was to factor up results trip matrices from GBATS to reflect the results of direct demand forecasts. However, annualised results drawn from GBATS modelling of the Greater Bristol Metro gave total increases in rail use that are slightly larger than the MOIRA2 and new station direct demand forecasts. Hence, GBATS results were factored down to match station demand forecast totals.

Closer inspection of GBATS results indicate that while the geographical distribution of modelled changes broadly follows the rail network, some details are not well-related to new stations in detail. This is not considered particularly significant, as the broad spread of changes is reasonable in the determination of overall economic benefits. However, representation of rail networks in the 'do minimum' model has some limitations, in particular in that differences between modelled journey time and generalised cost in the 'do minimum' and 'do something' scenarios are very significant for some movements. This is noted in most locations, but especially so around new stations, resulting in very large (and unrealistic) time saving benefits for rail users.

As such, TUBA has made use of most trip, time, cost and distance matrices directly from GBATS, and all for car, bus and BRT modes (including park & ride). Rail journey time changes calculated by GBATS have been adjusted. This has taken generalised journey times derived from MOIRA2 to calculate appropriate changes between 'do minimum' and 'do something' rail journey times for use in TUBA.

Another adjustment to use of GBATS data has related to the AM peak. Initial TUBA analyses using AM peak GBATS model results identified significant disbenefits for car users, which is not consistent with modelled reductions in car trips across the study area. This seems to be as a result of increasing overall travel demand in some areas (for example Severn Beach), which has slightly increased rail trips (to be expected), but also more significantly increased car trips to some key locations. This is partly at the expense of trips elsewhere, which is why overall car trips reduce. The effect (particularly on car trips) is out of scale with what would be expected and may

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<sup>5</sup> MOIRA2 is used by the rail industry to forecast the impact of timetables on passenger revenue, including analysing the effect of changes to a timetable such as stopping patterns, infrastructure and rolling stock on the passenger numbers carried and the revenue impact. MOIRA2 has been used in this study to prepare demand forecasts for the new and revised rail services of the Greater Bristol Metro.

be related to the same rail connectivity issue identified above. Bus journey time savings are also affected, albeit to a lesser extent. This occurs in all time periods, but the effects are only significant in the AM peak. As a result, PM peak costs (adjusted to reflect AM peak trip matrices) have been used for car and bus modes in determining final economic costs and benefits in the Analysis of Monetised Costs and Benefits.

### *Capital and operating costs*

Capital costs and revenue support subsidies have been included in the TUBA assessments as shown in **Error! Reference source not found.**. A series of capital cost sensitivity tests have been carried out, to reflect different levels of capital costs above those initially identified in this study, with capital costs increased by 10%, 20%, 30% and 50% respectively.

Greater Bristol Metro	Capital cost <sup>6</sup>	Revenue support (per annum)
Phase 1 capital cost estimate	£40.22m	£1.25m

*Table 6-5: Costs assumed for TUBA assessments*

Capital costs are assumed to be incurred in 2015 (25%) and 2016 (75%), with the Phase 1 opening year being 2017. Revenue support is assumed per annum from 2017 onwards to 2076 (60 year appraisal period). Refinements to the cost profile could include allocation of capital costs to different (later) years, ramp-up of demand and revenue support, and future year increases in demand reducing revenue support.

In deriving specific values for TUBA, costs have been inflated for risk (35%) and optimism bias (44%), reflecting the current project development status of the main capital works (Portishead line re-opening for passengers).

<sup>6</sup> Capital costs of £40.22m include the initial estimate of Phase 1 capital costs at £35.66m (which in turn includes Portishead re-opening works and a Bathampton turnback facility), with the addition of an allowance of £4.56m for extending the Severn Beach line passing place at Clifton Down to form a double-track section from Clifton Down to Redland stations.

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## Appendix D

Demand and Revenue Forecasting Results -  
Sensitivities

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## **Appendix D      Demand and Revenue Forecasting Results - Sensitivities**

**Table D.1: Phase 1**

Net changes	Phase 1 All elements
Capital Cost	£40,220,000
Additional Revenue	£3,762,455
Additional Operating Cost	£5,013,000
Surplus/Deficit	<b>-£1,250,545</b>

revenue & operating costs are 2011/12 annual figures at 2011 demand levels

- Notes:*
- Additional revenue and operating cost figures do not include revenues or operating costs derived from existing services that are extended and/or augmented
  - Phase 1 costs/revenues are combined because the key element (the three cross-Bristol services to Portishead, Severn Beach and Bath) are intrinsically interlinked
  - Capital costs under review

- Phase 1 includes:*
- Severn Beach - Portishead service (hourly)
  - Portishead - Bristol Temple Meads service (hourly)
  - Infrastructure work for passenger services on Portishead line
  - New stations at Portishead and Pill on Portishead line
  - Severn Beach - Bath service (hourly)
  - Turnback facility at Bathampton junction (no station)

**Table D.2: Phase 1 – 2017 opening year**

Net changes	Phase 1 All elements
Capital Cost	£40,220,000
Additional Revenue	£4,185,173
Additional Operating Cost	£5,013,000
Surplus/Deficit	<b>-£827,827</b>

revenue & operating costs are 2011/12 annual figures at 2017 demand levels

- Notes:*
- Additional revenue and operating cost figures do not include revenues or operating costs derived from existing services that are extended and/or augmented
  - Phase 1 costs/revenues are combined because the key element (the three cross-Bristol services to Portishead, Severn Beach and Bath) are intrinsically interlinked
  - Capital costs under review

- Phase 1 includes:*
- Severn Beach - Portishead service (hourly)
  - Portishead - Bristol Temple Meads service (hourly)
  - Infrastructure work for passenger services on Portishead line
  - New stations at Portishead and Pill on Portishead line
  - Severn Beach - Bath service (hourly)
  - Turnback facility at Bathampton junction (no station)

**Table D.3: Phases 1 sensitivity – 2016 forecasts**

Net changes	Phase 1 All elements 2011	Phase 1+ 2016 forecast Tempro	Phase 1+ 2016 forecast ORR growth	Phase 1+ 2016 forecast AVERAGE
Capital Cost	£40,220,000	£40,220,000	£40,220,000	£40,220,000
Additional Revenue	£3,762,455	£3,938,887	£4,597,994	£4,252,398
Additional Operating Cost	£5,013,000	£5,013,000	£5,013,000	£5,013,000
Surplus/Deficit	-£1,250,545	-£1,074,113	-£415,006	-£760,602

all revenue & operating costs are in 2011/12 figures

- Notes:*
- Additional revenue and operating cost figures do not include revenues or operating costs derived from existing services that are extended and/or augmented
  - Phase 1 costs/revenues are combined because the key element (the three cross-Bristol services to Portishead, Severn Beach and Bath) are intrinsically interlinked
  - Capital costs under review

- Phase 1 includes:*
- Severn Beach - Portishead service (hourly)
  - Portishead - Bristol Temple Meads service (hourly)
  - Infrastructure work for passenger services on Portishead line
  - New stations at Portishead and Pill on Portishead line
  - Severn Beach - Bath service (hourly)
  - Turnback facility at Bathampton junction (no station)

- 2016 forecasts:*
- Sources of figures used to factor existing demand and forecasts...
  - Tempro population figures for station catchments
  - recent ORR station use growth rates (2004-2011)
  - geometric mean of the two forecasts

**Table D.4: Phases 1 sensitivity – Temple Meads local changes**

Net changes	Phase 1 All elements	Phase 1+ increase BTM growth (EZ)	Phase 1+ release BTM suppressed trips
Capital Cost	£40,220,000	£40,220,000	£40,220,000
Additional Revenue	£3,762,455	£3,975,716	£3,851,260
Additional Operating Cost	£5,013,000	£5,013,000	£5,013,000
Surplus/Deficit	-£1,250,545	-£1,037,284	-£1,161,740

revenue & operating costs are 2011/12 annual figures at 2011 demand levels

- Notes:*
- Additional revenue and operating cost figures do not include revenues or operating costs derived from existing services that are extended and/or augmented
  - Phase 1 costs/revenues are combined because the key element (the three cross-Bristol services to Portishead, Severn Beach and Bath) are intrinsically interlinked
  - Capital costs under review

- Phase 1 includes:*
- Severn Beach - Portishead service (hourly)
  - Portishead - Bristol Temple Meads service (hourly)
  - Infrastructure work for passenger services on Portishead line
  - New stations at Portishead and Pill on Portishead line
  - Severn Beach - Bath service (hourly)
  - Turnback facility at Bathampton junction (no station)

*BTM suppressed trips:* - assume base passenger throughput at Bristol Temple Meads increased by 5.8%

*BTM growth (EZ):* - assume growth in base passenger throughput at Bristol Temple Meads of 25%

- revenue shown is effect of Phase on revised Temple Meads base
- growth at new stations based on assumed proportion of Temple Meads trips

## Detailed station and service results

### *Phase 1...*

- revised forecast

### *Phase 1 – sensitivity tests...*

- future year 2016 forecast (using on Temprow population figures)
- future year 2016 forecast (based on ORR station data growth)
- future year 2016 forecast (based on average of Temprow & ORR growth)
- additional Bristol Temple Meads development (Enterprise Zone)
- Bristol Temple Meads latent/suppressed demand
- sensitivity test – local fares increased by 2%
- sensitivity test – local fares increased by 5%
- sensitivity test – local fares increased by 10%
- sensitivity test – Severn Beach fares increased by £0.25
- sensitivity test – Severn Beach fares increased by £0.50
- sensitivity test – Severn Beach fares increased by £1.00
- sensitivity test – Severn Beach fares increased by £2.00
- sensitivity test – combined scenario

## Phase 1 – revised forecast

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	88,778	103,346	£206,163	£22,648	-£586			£228,225	£22,062	
Bath Spa	existing line	5,560,338	5,642,598	£51,284,189	£244,063	-£1,149			£51,527,103	£242,914	
Bedminster	existing line	76,480	80,541	£293,362	£12,072	-			£305,434	£12,072	
Bristol Parkway	existing line	2,151,282	2,152,573	£42,177,735	£2,895	-£5,519			£42,175,112	-£2,624	
Bristol Temple Meads	existing line	8,717,636	8,855,007	£94,247,689	£158,460	-£5,071			£94,401,078	£153,389	
Clifton Down	Severn Beach line	470,573	556,507	£1,144,667	£150,084	-			£1,294,751	£150,084	
Filton Abbey Wood	existing line	770,855	774,571	£3,392,143	£10,371	-£2,026			£3,400,488	£8,345	
Freshford	existing line	37,251	37,285	£200,713	£144	-			£200,857	£144	
Keynsham	existing line	305,702	343,902	£1,333,579	£91,651	-£434			£1,424,796	£91,217	
Lawrence Hill	existing line	103,050	115,197	£318,457	£24,203	-			£342,659	£24,203	
Montpelier	Severn Beach line	122,303	142,074	£496,945	£54,891	-			£551,836	£54,891	
Nailsea & Backwell	existing line	403,830	401,009	£2,694,153	-£11,976	-£122,687			£2,559,490	-£134,663	
Oldfield Park	existing line	252,572	280,446	£1,079,499	£94,197	-			£1,173,696	£94,197	
Parson Street	existing line	78,091	83,297	£328,666	£16,726	-			£345,392	£16,726	
Patchway	existing line	67,495	67,931	£257,598	£1,522	-£260			£258,860	£1,262	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	96,670	111,427	£481,997	£50,546	-			£532,543	£50,546	
Sea Mills	Severn Beach line	51,990	60,677	£134,653	£16,473	-			£151,126	£16,473	
Severn Beach	Severn Beach line	141,756	203,787	£153,590	£61,179	-£1,405			£213,365	£59,774	
Shirehampton	Severn Beach line	43,560	50,384	£118,797	£13,273	-£5,546			£126,524	£7,727	
St. Andrew's Road	Severn Beach line	6,109	9,063	£13,529	£4,599	-			£18,128	£4,599	
Stapleton Road	existing line	129,487	142,130	£480,643	£27,954	-£312			£508,285	£27,642	
Weston Milton	existing line	46,758	46,946	£233,118	£572	-			£233,690	£572	
Weston-super-Mare	existing line	1,095,611	1,093,525	£7,387,441	-£12,993	-£973			£7,373,475	-£13,966	
Worle	existing line	239,897	238,537	£1,650,737	-£8,324	-			£1,642,413	-£8,324	
Yate	existing line	295,000	295,387	£1,084,372	£1,063	-£65			£1,085,370	£998	
Yatton	existing line	377,647	375,755	£3,211,365	-£11,029	-£43,692			£3,156,644	-£54,720	
transfers from other existing stations						-£29,217				-£29,217	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	140,078	-	-	-	5%	£21,470	£414,064	£414,064	
Portishead	NEW Portishead line	-	267,753	-	-	-	8%	£186,469	£2,385,871	£2,385,871	
Portway P&R	NEW Severn Beach line	-	53,352	-	-	-	7%	£11,004	£166,196	£166,196	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>21,730,933</b>	<b>22,725,298</b>	<b>£214,406,506</b>	<b>£1,015,267</b>	<b>-£218,943</b>	<b>£2,966,131</b>	<b>7%</b>	<b>£218,943</b>	<b>£218,198,178</b>	<b>£3,762,455</b>
<b>New Revenue</b>			<i>change in journeys: 994,365</i>		net total at existing stations: <b>£796,324</b>		total at new stations: <b>£2,966,131</b>		all stations: <b>£3,762,455</b>		

## Phase 1 – revised forecast – 2017 opening year

Location		JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway
		Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue from existing to new stations	Gross Revenue total - including transfers revenue	Trips through new stations previously using existing stations <i>Proportion of demand at new station</i>	Transfer reven- -ue (incl in New station gross)		
Avonmouth	Severn Beach line	106,413	123,875	£247,115	£27,147	-£637			£273,625	£26,510	
Bath Spa	existing line	6,664,844	6,763,444	£61,471,283	£292,544	-£1,250			£61,762,577	£291,294	
Bedminster	existing line	91,672	96,540	£351,635	£14,470	-			£366,106	£14,470	
Bristol Parkway	existing line	2,578,612	2,580,160	£50,555,923	£3,471	-£6,002			£50,553,392	-£2,531	
Bristol Temple Meads	existing line	10,449,308	10,613,966	£112,969,055	£189,937	-£5,515			£113,153,477	£184,422	
Clifton Down	Severn Beach line	564,047	667,051	£1,372,044	£179,897	-			£1,551,941	£179,897	
Filton Abbey Wood	existing line	923,977	928,432	£4,065,959	£12,431	-£2,203			£4,076,187	£10,228	
Freshford	existing line	44,651	44,692	£240,582	£173	-			£240,755	£173	
Keynsham	existing line	366,427	412,215	£1,598,481	£109,857	-£472			£1,707,866	£109,385	
Lawrence Hill	existing line	123,520	138,079	£381,715	£29,010	-			£410,725	£29,010	
Montpelier	Severn Beach line	146,597	170,296	£595,658	£65,795	-			£661,453	£65,795	
Nailsea & Backwell	existing line	484,047	480,666	£3,229,320	-£14,355	-£133,416			£3,081,549	-£147,771	
Oldfield Park	existing line	302,743	336,154	£1,293,931	£112,909	-			£1,406,839	£112,909	
Parson Street	existing line	93,603	99,843	£393,952	£20,048	-			£414,000	£20,048	
Patchway	existing line	80,902	81,425	£308,767	£1,824	-£283			£310,309	£1,542	
Pilning	existing line	255	255	£845	-	-			£845	-	
Redland	Severn Beach line	115,873	133,561	£577,741	£60,586	-			£638,327	£60,586	
Sea Mills	Severn Beach line	62,317	72,730	£161,400	£19,746	-			£181,146	£19,746	
Severn Beach	Severn Beach line	169,914	244,267	£184,099	£73,332	-£1,528			£255,903	£71,804	
Shirehampton	Severn Beach line	52,213	60,392	£142,395	£15,909	-£6,031			£152,273	£9,878	
St. Andrew's Road	Severn Beach line	7,322	10,863	£16,216	£5,513	-			£21,729	£5,513	
Stapleton Road	existing line	155,208	170,363	£576,118	£33,507	-£339			£609,286	£33,168	
Weston Milton	existing line	56,046	56,272	£279,424	£686	-			£280,110	£686	
Weston-super-Mare	existing line	1,313,243	1,310,743	£8,854,883	-£15,574	-£1,058			£8,838,250	-£16,632	
Worle	existing line	287,551	285,920	£1,978,640	-£9,977	-			£1,968,662	-£9,977	
Yate	existing line	353,598	354,063	£1,299,772	£1,275	-£71			£1,300,976	£1,203	
Yatton	existing line	452,663	450,394	£3,849,270	-£13,219	-£47,513			£3,788,538	-£60,732	
transfers from other existing stations						-£31,772				-£31,772	
Ashley Down	NEW existing line		-						-	-	
Ashton Gate	NEW Portishead line		-						-	-	
Corsham	NEW existing line		-						-	-	
Filton North	NEW Henbury line		-						-	-	
Henbury	NEW Henbury line		-						-	-	
Horfield	NEW existing line		-						-	-	
Pill	NEW Portishead line		150,756				£445,418	5%	£23,036	£445,418	
Portishead	NEW Portishead line		289,497				£2,582,944	8%	£203,292	£2,582,944	
Portway P&R	NEW Severn Beach line		57,285				£177,961	7%	£11,761	£177,961	
Saltford	NEW existing line		-						-	-	
<b>Totals</b>		<b>26,047,567</b>	<b>27,184,199</b>	<b>£256,996,226</b>	<b>£1,216,940</b>	<b>-£238,090</b>	<b>£3,206,323</b>	<b>7%</b>	<b>£238,090</b>	<b>£261,213,171</b>	<b>£4,185,173</b>
<b>New Revenue</b>		<i>change in journeys: 1,136,632</i>		net total at existing stations: <b>£978,850</b>			total at new stations: <b>£3,206,323</b>		all stations: <b>£4,185,173</b>		

## Phase 1 – sensitivity test – future year 2016 forecast (using on Tempo population figures)

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values - augmented to 2016

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway			
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>						
Avonmouth	Severn Beach line	91,967	107,058	£213,568	£23,462	-£607			£236,423	£22,854			
Bath Spa	existing line	5,810,380	5,896,340	£53,590,386	£255,039	-£1,201			£53,844,223	£253,838			
Bedminster	existing line	80,162	84,419	£307,487	£12,653	-			£320,140	£12,653			
Bristol Parkway	existing line	2,267,246	2,268,607	£44,451,322	£3,051	-£5,817			£44,448,557	-£2,765			
Bristol Temple Meads	existing line	9,115,291	9,258,928	£98,546,797	£165,688	-£5,303			£98,707,182	£160,386			
Clifton Down	Severn Beach line	493,020	583,053	£1,199,270	£157,243	-			£1,356,513	£157,243			
Filton Abbey Wood	existing line	806,366	810,254	£3,548,412	£10,849	-£2,119			£3,557,141	£8,729			
Freshford	existing line	39,340	39,376	£211,970	£152	-			£212,122	£152			
Keynsham	existing line	322,354	362,635	£1,406,219	£96,643	-£458			£1,502,405	£96,186			
Lawrence Hill	existing line	106,732	119,313	£329,836	£25,067	-			£354,903	£25,067			
Montpelier	Severn Beach line	127,990	148,681	£520,053	£57,444	-			£577,497	£57,444			
Nailsea & Backwell	existing line	424,838	421,870	£2,834,303	-£12,599	-£129,069			£2,692,635	-£141,668			
Oldfield Park	existing line	264,808	294,033	£1,131,797	£98,761	-			£1,230,557	£98,761			
Parson Street	existing line	81,852	87,309	£344,496	£17,531	-			£362,027	£17,531			
Patchway	existing line	70,757	71,215	£270,049	£1,596	-£273			£271,372	£1,323			
Pilning	existing line	224	224	£741	-	-			£741	-			
Redland	Severn Beach line	100,393	115,718	£500,558	£52,492	-			£553,051	£52,492			
Sea Mills	Severn Beach line	54,100	63,139	£140,117	£17,142	-			£157,259	£17,142			
Severn Beach	Severn Beach line	149,258	214,572	£161,718	£64,417	-£1,479			£224,656	£62,938			
Shirehampton	Severn Beach line	45,302	52,399	£123,548	£13,804	-£5,768			£131,584	£8,036			
St. Andrew's Road	Severn Beach line	6,109	9,063	£13,529	£4,599	-			£18,128	£4,599			
Stapleton Road	existing line	136,012	149,293	£504,864	£29,363	-£328			£533,899	£29,035			
Weston Milton	existing line	49,010	49,208	£244,348	£600	-			£244,947	£600			
Weston-super-Mare	existing line	1,145,577	1,143,396	£7,724,353	-£13,586	-£1,018			£7,709,750	-£14,603			
Worle	existing line	251,211	249,786	£1,728,586	-£8,716	-			£1,719,869	-£8,716			
Yate	existing line	307,825	308,229	£1,131,515	£1,110	-£68			£1,132,556	£1,041			
Yatton	existing line	396,264	394,278	£3,369,670	-£11,572	-£45,846			£3,312,253	-£57,418			
transfers from other existing stations						-£30,601				-£30,601			
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-			
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-			
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-			
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-			
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-			
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-			
Pill	NEW Portishead line	-	146,712	-	-	£433,674	5%	£22,550	£433,674	£433,674			
Portishead	NEW Portishead line	-	280,434	-	-	£2,498,866	8%	£195,846	£2,498,866	£2,498,866			
Portway P&R	NEW Severn Beach line	-	55,878	-	-	£174,067	7%	£11,557	£174,067	£174,067			
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-			
<b>Totals</b>		<b>22,744,389</b>	<b>23,785,418</b>	<b>£224,549,512</b>	<b>£1,062,233</b>	<b>-£229,953</b>			<b>£3,106,607</b>	<b>7%</b>	<b>£229,953</b>	<b>£228,518,999</b>	<b>£3,938,887</b>

## New Revenue

change in journeys: 1,041,029

net total at existing stations: £832,280

total at new stations: £3,106,607

all stations: £3,938,887

## Phase 1 – sensitivity test – future year 2016 forecast (based on ORR station data growth)

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values - augmented to 2016

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	125,524	146,122	£291,496	£32,022	-£829			£322,689	£31,194	
Bath Spa	existing line	6,519,192	6,615,638	£60,127,910	£286,151	-£1,348			£60,412,714	£284,803	
Bedminster	existing line	99,454	104,735	£381,484	£15,699	-			£397,183	£15,699	
Bristol Parkway	existing line	2,634,190	2,635,771	£51,645,562	£3,545	-£6,758			£51,642,349	-£3,213	
Bristol Temple Meads	existing line	10,431,313	10,595,688	£112,774,512	£189,610	-£6,068			£112,958,053	£183,541	
Clifton Down	Severn Beach line	679,106	803,121	£1,651,924	£216,594	-			£1,868,517	£216,594	
Filton Abbey Wood	existing line	995,907	1,000,708	£4,382,487	£13,399	-£2,618			£4,393,268	£10,781	
Freshford	existing line	44,357	44,398	£239,001	£172	-			£239,173	£172	
Keynsham	existing line	368,668	414,736	£1,608,257	£110,529	-£523			£1,718,262	£110,005	
Lawrence Hill	existing line	135,756	151,758	£419,528	£31,884	-			£451,412	£31,884	
Montpelier	Severn Beach line	151,278	175,733	£614,676	£67,895	-			£682,571	£67,895	
Nailsea & Backwell	existing line	486,302	482,905	£3,244,364	-£14,422	-£147,742			£3,082,200	-£162,164	
Oldfield Park	existing line	305,275	338,965	£1,304,751	£113,853	-			£1,418,603	£113,853	
Parson Street	existing line	157,661	168,170	£663,555	£33,768	-			£697,323	£33,768	
Patchway	existing line	93,171	93,774	£355,594	£2,101	-£359			£357,336	£1,742	
Pilning	existing line	216	216	£716	-	-			£716	-	
Redland	Severn Beach line	117,616	135,570	£586,431	£61,498	-			£647,929	£61,498	
Sea Mills	Severn Beach line	62,842	73,342	£162,759	£19,912	-			£182,671	£19,912	
Severn Beach	Severn Beach line	228,974	329,171	£248,089	£98,821	-£2,269			£344,641	£96,552	
Shirehampton	Severn Beach line	54,261	62,761	£147,980	£16,533	-£6,909			£157,605	£9,625	
St. Andrew's Road	Severn Beach line	6,109	9,063	£13,529	£4,599	-			£18,128	£4,599	
Stapleton Road	existing line	165,188	181,318	£613,164	£35,661	-£398			£648,428	£35,264	
Weston Milton	existing line	58,444	58,679	£291,377	£715	-			£292,092	£715	
Weston-super-Mare	existing line	1,287,440	1,284,988	£8,680,896	-£15,268	-£1,144			£8,664,484	-£16,412	
Worle	existing line	317,749	315,947	£2,186,434	-£11,025	-			£2,175,409	-£11,025	
Yate	existing line	389,404	389,916	£1,431,389	£1,404	-£86			£1,432,706	£1,317	
Yatton	existing line	465,493	463,160	£3,958,367	-£13,594	-£53,855			£3,890,918	-£67,449	
transfers from other existing stations						-£35,086				-£35,086	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	168,215	-	-	£497,236	5%	£26,084	£497,236	£497,236	
Portishead	NEW Portishead line	-	321,536	-	-	£2,865,115	8%	£226,539	£2,865,115	£2,865,115	
Portway P&R	NEW Severn Beach line	-	64,068	-	-	£199,579	7%	£13,368	£199,579	£199,579	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>26,380,887</b>	<b>27,630,171</b>	<b>£258,026,231</b>	<b>£1,302,055</b>	<b>-£265,991</b>		<b>7%</b>	<b>£265,991</b>	<b>£262,659,310</b>	<b>£4,597,994</b>

## New Revenue

change in journeys: 1,249,284

net total at existing stations: £1,036,064

total at new stations: £3,561,930

all stations: £4,597,994

## Phase 1 – sensitivity test – future year 2016 forecast (based on average of Tempo &amp; ORR growth)

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values - augmented to 2016

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue from existing to new stations	Gross Revenue total - including transfers revenue	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer revenue (incl in New station gross)</i>			
Avonmouth	Severn Beach line	107,443	125,074	£249,508	£27,410	-£718			£276,200	£26,692
Bath Spa	existing line	6,154,591	6,245,643	£56,765,112	£270,147	-£1,274			£57,033,985	£268,873
Bedminster	existing line	89,288	94,030	£342,493	£14,094	-			£356,587	£14,094
Bristol Parkway	existing line	2,443,841	2,445,307	£47,913,605	£3,289	-£6,288			£47,910,606	-£2,998
Bristol Temple Meads	existing line	9,751,126	9,904,782	£105,420,903	£177,246	-£5,686			£105,592,464	£171,560
Clifton Down	Severn Beach line	578,630	684,297	£1,407,516	£184,548	-			£1,592,064	£184,548
Filton Abbey Wood	existing line	896,139	900,460	£3,943,459	£12,056	-£2,368			£3,953,147	£9,688
Freshford	existing line	41,773	41,812	£225,080	£162	-			£225,242	£162
Keynsham	existing line	344,734	387,811	£1,503,849	£103,353	-£491			£1,606,712	£102,863
Lawrence Hill	existing line	120,372	134,561	£371,989	£28,271	-			£400,260	£28,271
Montpelier	Severn Beach line	139,148	161,642	£565,389	£62,451	-			£627,840	£62,451
Nailsea & Backwell	existing line	454,532	451,357	£3,032,410	-£13,511	-£138,405			£2,880,494	-£151,916
Oldfield Park	existing line	284,322	315,701	£1,215,201	£106,039	-			£1,321,239	£106,039
Parson Street	existing line	113,600	121,172	£478,113	£24,331	-			£502,444	£24,331
Patchway	existing line	81,195	81,720	£309,884	£1,831	-£316			£311,399	£1,515
Pilning	existing line	220	220	£728	-	-			£728	-
Redland	Severn Beach line	108,663	125,252	£541,796	£56,817	-			£598,613	£56,817
Sea Mills	Severn Beach line	58,307	68,050	£151,014	£18,475	-			£169,489	£18,475
Severn Beach	Severn Beach line	184,868	265,765	£200,301	£79,786	-£1,874			£278,213	£77,912
Shirehampton	Severn Beach line	49,580	57,346	£135,213	£15,107	-£6,338			£143,982	£8,769
St. Andrew's Road	Severn Beach line	6,109	9,063	£13,529	£4,599	-			£18,128	£4,599
Stapleton Road	existing line	149,892	164,528	£556,385	£32,359	-£363			£588,381	£31,996
Weston Milton	existing line	53,520	53,735	£266,828	£655	-			£267,483	£655
Weston-super-Mare	existing line	1,214,439	1,212,127	£8,188,669	-£14,427	-£1,081			£8,173,162	-£15,507
Worle	existing line	282,528	280,926	£1,944,078	-£9,871	-			£1,934,207	-£9,871
Yate	existing line	346,220	346,675	£1,272,650	£1,248	-£77			£1,273,820	£1,171
Yatton	existing line	429,486	427,333	£3,652,176	-£12,583	-£49,850			£3,589,743	-£62,434
transfers from other existing stations						-£32,843				-£32,843
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-
Pill	NEW Portishead line	-	157,096	-	-	£464,369	5%	£24,317	£464,369	£464,369
Portishead	NEW Portishead line	-	300,283	-	-	£2,675,731	8%	£211,192	£2,675,731	£2,675,731
Portway P&R	NEW Severn Beach line	-	59,833	-	-	£186,387	7%	£12,463	£186,387	£186,387
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-
<b>Totals</b>		<b>24,484,565</b>	<b>25,623,597</b>	<b>£240,667,878</b>	<b>£1,173,883</b>	<b>-£247,972</b>	<b>7%</b>	<b>£247,972</b>	<b>£244,953,119</b>	<b>£4,252,398</b>

## New Revenue

change in journeys: 1,139,032

net total at existing stations: £925,911

total at new stations: £3,326,487

all stations: £4,252,398

## Phase 1 – sensitivity test – additional Bristol Temple Meads development (Enterprise Zone)

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing <i>revised base</i>	Forecast <i>incl generated and existing</i>	Existing Revenue <i>revised base</i>	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	98,139	114,048	£218,299	£24,378	-£604			£242,074	£23,775	
Bath Spa	existing line	5,819,749	5,909,574	£51,942,650	£277,718	-£1,166			£52,219,202	£276,552	
Bedminster	existing line	78,009	82,204	£295,093	£12,223	-			£307,316	£12,223	
Bristol Parkway	existing line	2,214,067	2,215,317	£42,284,774	£1,621	-£5,532			£42,280,864	-£3,911	
Bristol Temple Meads	existing line	10,862,213	11,036,036	£117,063,271	£253,703	-£6,339			£117,310,635	£247,364	
Clifton Down	Severn Beach line	521,719	614,539	£1,187,809	£155,864	-			£1,343,673	£155,864	
Filton Abbey Wood	existing line	805,454	809,178	£3,452,945	£10,387	-£2,038			£3,461,293	£8,348	
Freshford	existing line	39,575	39,610	£210,385	£144	-			£210,529	£144	
Keynsham	existing line	332,560	374,561	£1,382,772	£98,612	-£446			£1,480,938	£98,166	
Lawrence Hill	existing line	107,671	120,525	£322,244	£24,784	-			£347,029	£24,784	
Montpelier	Severn Beach line	131,232	152,292	£503,946	£55,892	-			£559,838	£55,892	
Nailsea & Backwell	existing line	442,801	439,265	£2,767,557	-£13,326	-£125,522			£2,628,710	-£138,848	
Oldfield Park	existing line	280,557	312,710	£1,168,585	£107,835	-			£1,276,420	£107,835	
Parson Street	existing line	80,239	85,665	£331,270	£17,001	-			£348,271	£17,001	
Patchway	existing line	74,730	75,158	£271,588	£1,506	-£282			£272,812	£1,224	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	104,985	120,909	£488,261	£51,418	-			£539,679	£51,418	
Sea Mills	Severn Beach line	56,447	65,795	£139,430	£17,184	-			£156,614	£17,184	
Severn Beach	Severn Beach line	161,590	231,951	£173,416	£69,453	-£1,416			£241,453	£68,037	
Shirehampton	Severn Beach line	46,529	53,760	£122,706	£13,810	-£5,735			£130,782	£8,076	
St. Andrew's Road	Severn Beach line	6,898	10,262	£14,493	£5,091	-			£19,585	£5,091	
Stapleton Road	existing line	136,136	149,532	£486,931	£28,669	-£312			£515,288	£28,357	
Weston Milton	existing line	51,348	51,535	£250,074	£568	-			£250,641	£568	
Weston-super-Mare	existing line	1,192,759	1,190,018	£7,692,259	-£13,950	-£1,007			£7,677,302	-£14,957	
Worle	existing line	264,318	262,648	£1,736,311	-£9,323	-			£1,726,988	-£9,323	
Yate	existing line	327,161	327,548	£1,155,251	£1,063	-£69			£1,156,245	£995	
Yatton	existing line	409,567	407,172	£3,298,469	-£12,359	-£45,288			£3,240,822	-£57,647	
transfers from other existing stations						-£29,627				-£29,627	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	144,699	-	-	-	5%	£22,102	£423,621	£423,621	
Portishead	NEW Portishead line	-	289,979	-	-	-	8%	£191,953	£2,429,273	£2,429,273	
Portway P&R	NEW Severn Beach line	-	54,940	-	-	-	7%	£11,327	£168,238	£168,238	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>24,646,665</b>	<b>25,741,642</b>	<b>£238,961,495</b>	<b>£1,179,966</b>	<b>-£225,382</b>		<b>7%</b>	<b>£225,382</b>	<b>£242,966,837</b>	<b>£3,975,716</b>

## New Revenue

change in journeys: 1,094,977

net total at existing stations: £954,584

total at new stations: £3,021,131

all stations: £3,975,716

## Phase 1 – sensitivity test – Bristol Temple Meads latent/suppressed demand

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue from existing to new stations	Gross Revenue total - including transfers revenue	Trips through new stations previously using existing stations. Proportion of demand at new station				Transfer reven- -ue (incl in New station gross)
	revised base	incl generated and existing	revised base								
Avonmouth	Severn Beach line	90,950	105,829	£208,979	£23,050	-£590				£231,438	£22,459
Bath Spa	existing line	5,619,502	5,702,898	£51,419,026	£248,076	-£1,153				£51,665,949	£246,923
Bedminster	existing line	76,835	80,927	£293,764	£12,107	-				£305,871	£12,107
Bristol Parkway	existing line	2,165,902	2,167,190	£42,204,013	£2,844	-£5,522				£42,201,334	-£2,679
Bristol Temple Meads	existing line	9,214,682	9,361,655	£99,525,762	£222,777	-£5,367				£99,743,172	£217,409
Clifton Down	Severn Beach line	482,439	569,970	£1,154,676	£151,425	-				£1,306,101	£151,425
Filton Abbey Wood	existing line	778,882	782,600	£3,406,248	£10,376	-£2,029				£3,414,595	£8,347
Freshford	existing line	37,790	37,824	£202,957	£144	-				£203,101	£144
Keynsham	existing line	311,933	351,015	£1,344,992	£93,266	-£437				£1,437,821	£92,829
Lawrence Hill	existing line	104,122	116,433	£319,335	£24,337	-				£343,673	£24,337
Montpelier	Severn Beach line	124,374	144,444	£498,569	£55,123	-				£553,692	£55,123
Nailsea & Backwell	existing line	412,874	409,896	£2,711,233	-£12,122	-£123,348				£2,575,763	-£135,470
Oldfield Park	existing line	259,065	287,931	£1,100,167	£97,361	-				£1,197,528	£97,361
Parson Street	existing line	78,589	83,846	£329,270	£16,790	-				£346,060	£16,790
Patchway	existing line	69,174	69,608	£260,844	£1,518	-£265				£262,097	£1,253
Pilning	existing line	213	213	£705	-	-				£705	-
Redland	Severn Beach line	98,599	113,627	£483,450	£50,748	-				£534,198	£50,748
Sea Mills	Severn Beach line	53,024	61,864	£135,761	£16,638	-				£152,399	£16,638
Severn Beach	Severn Beach line	146,357	210,321	£158,190	£63,099	-£1,408				£219,881	£61,691
Shirehampton	Severn Beach line	44,249	51,167	£119,704	£13,398	-£5,590				£127,511	£7,807
St. Andrew's Road	Severn Beach line	6,292	9,341	£13,753	£4,713	-				£18,466	£4,713
Stapleton Road	existing line	131,029	143,848	£482,102	£28,120	-£312				£509,910	£27,808
Weston Milton	existing line	47,823	48,011	£237,051	£571	-				£237,623	£571
Weston-super-Mare	existing line	1,118,145	1,115,914	£7,458,073	-£13,071	-£981				£7,444,021	-£14,052
Worle	existing line	245,564	244,137	£1,670,619	-£8,442	-				£1,662,177	-£8,442
Yate	existing line	302,461	302,849	£1,100,816	£1,063	-£66				£1,101,813	£997
Yatton	existing line	385,057	383,056	£3,231,650	-£11,172	-£44,064				£3,176,414	-£55,237
transfers from other existing stations						-£29,313					-£29,313
Ashley Down	NEW existing line	-	-	-	-	-				-	-
Ashton Gate	NEW Portishead line	-	-	-	-	-				-	-
Corsham	NEW existing line	-	-	-	-	-				-	-
Filton North	NEW Henbury line	-	-	-	-	-				-	-
Henbury	NEW Henbury line	-	-	-	-	-				-	-
Horfield	NEW existing line	-	-	-	-	-				-	-
Pill	NEW Portishead line	-	141,156	-	-	-	£416,295	5%	£21,618	£416,295	£416,295
Portishead	NEW Portishead line	-	272,940	-	-	-	£2,396,000	8%	£187,749	£2,396,000	£2,396,000
Portway P&R	NEW Severn Beach line	-	53,722	-	-	-	£166,672	7%	£11,079	£166,672	£166,672
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	-
<b>Totals</b>		<b>22,405,925</b>	<b>23,424,234</b>	<b>£220,071,708</b>	<b>£1,092,739</b>	<b>-£220,446</b>	<b>£2,978,967</b>	<b>7%</b>	<b>£220,446</b>	<b>£223,952,281</b>	<b>£3,851,260</b>

## New Revenue

change in journeys: 1,018,310

net total at existing stations: £872,293

total at new stations: £2,978,967

all stations: £3,851,260

## Phase 1 – sensitivity test – local fares increased by 2%

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	88,778	101,837	£206,163	£21,220	-£586			£226,796	£20,633	
Bath Spa	existing line	5,560,338	5,586,906	£51,284,189	£226,738	-£1,149			£51,509,778	£225,589	
Bedminster	existing line	76,480	79,334	£293,362	£11,067	-			£304,429	£11,067	
Bristol Parkway	existing line	2,151,282	2,136,921	£42,177,735	-£15,512	-£5,519			£42,156,704	-£21,031	
Bristol Temple Meads	existing line	8,717,636	8,765,064	£94,247,689	£102,291	-£5,071			£94,344,909	£97,220	
Clifton Down	Severn Beach line	470,573	548,517	£1,144,667	£145,482	-			£1,290,149	£145,482	
Filton Abbey Wood	existing line	770,855	763,725	£3,392,143	£100	-£2,026			£3,390,217	-£1,926	
Freshford	existing line	37,251	36,797	£200,713	-£569	-			£200,144	-£569	
Keynsham	existing line	305,702	339,024	£1,333,579	£87,914	-£434			£1,421,059	£87,480	
Lawrence Hill	existing line	103,050	113,495	£318,457	£22,651	-			£341,108	£22,651	
Montpelier	Severn Beach line	122,303	140,131	£496,945	£53,271	-			£550,216	£53,271	
Nailsea & Backwell	existing line	403,830	395,713	£2,694,153	-£15,584	-£122,687			£2,555,883	-£138,270	
Oldfield Park	existing line	252,572	276,526	£1,079,499	£90,910	-			£1,170,409	£90,910	
Parson Street	existing line	78,091	82,060	£328,666	£16,006	-			£344,672	£16,006	
Patchway	existing line	67,495	66,880	£257,598	£272	-£260			£257,610	£12	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	96,670	109,961	£481,997	£49,585	-			£531,582	£49,585	
Sea Mills	Severn Beach line	51,990	59,811	£134,653	£15,887	-			£150,540	£15,887	
Severn Beach	Severn Beach line	141,756	200,838	£153,590	£60,418	-£1,405			£212,603	£59,013	
Shirehampton	Severn Beach line	43,560	49,656	£118,797	£12,629	-£5,546			£125,879	£7,082	
St. Andrew's Road	Severn Beach line	6,109	8,927	£13,529	£4,516	-			£18,045	£4,516	
Stapleton Road	existing line	129,487	140,071	£480,643	£26,033	-£312			£506,364	£25,721	
Weston Milton	existing line	46,758	46,275	£233,118	-£166	-			£232,952	-£166	
Weston-super-Mare	existing line	1,095,611	1,079,554	£7,387,441	-£17,393	-£973			£7,369,074	-£18,367	
Worle	existing line	239,897	235,286	£1,650,737	-£11,840	-			£1,638,897	-£11,840	
Yate	existing line	295,000	291,000	£1,084,372	-£844	-£65			£1,083,463	-£909	
Yatton	existing line	377,647	371,045	£3,211,365	-£14,694	-£43,692			£3,152,979	-£58,386	
transfers from other existing stations						-£29,217				-£29,217	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	138,039	-	-	-	5%	£21,158	£408,039	£408,039	
Portishead	NEW Portishead line	-	264,304	-	-	-	8%	£184,067	£2,355,139	£2,355,139	
Portway P&R	NEW Severn Beach line	-	52,580	-	-	-	7%	£10,845	£163,791	£163,791	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>21,730,933</b>	<b>22,480,491</b>	<b>£214,406,506</b>	<b>£870,386</b>	<b>-£218,943</b>		<b>7%</b>	<b>£216,070</b>	<b>£218,014,135</b>	<b>£3,578,412</b>

## New Revenue

change in journeys: 749,558

net total at existing stations: £651,443

total at new stations: £2,926,969

all stations: £3,578,412

## Phase 1 – sensitivity test – local fares increased by 5%

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i>	Transfer reven- -ue ( <i>incl in New station gross</i> )			
Avonmouth	Severn Beach line	88,778	99,670	£206,163	£19,178	-£586			£224,755	£18,592	
Bath Spa	existing line	5,560,338	5,507,655	£51,284,189	£215,360	-£1,149			£51,498,399	£214,210	
Bedminster	existing line	76,480	77,603	£293,362	£9,646	-			£303,008	£9,646	
Bristol Parkway	existing line	2,151,282	2,114,495	£42,177,735	-£41,591	-£5,519			£42,130,625	-£47,110	
Bristol Temple Meads	existing line	8,717,636	8,638,085	£94,247,689	£88,891	-£5,071			£94,331,509	£83,819	
Clifton Down	Severn Beach line	470,573	537,047	£1,144,667	£138,948	-			£1,283,616	£138,948	
Filton Abbey Wood	existing line	770,855	748,171	£3,392,143	-£14,431	-£2,026			£3,375,687	-£16,457	
Freshford	existing line	37,251	36,096	£200,713	-£1,585	-			£199,127	-£1,585	
Keynsham	existing line	305,702	332,026	£1,333,579	£82,621	-£434			£1,415,766	£82,187	
Lawrence Hill	existing line	103,050	111,053	£318,457	£20,445	-			£338,902	£20,445	
Montpelier	Severn Beach line	122,303	137,343	£496,945	£50,968	-			£547,913	£50,968	
Nailsea & Backwell	existing line	403,830	388,121	£2,694,153	-£20,577	-£122,687			£2,550,890	-£143,263	
Oldfield Park	existing line	252,572	270,899	£1,079,499	£86,285	-			£1,165,784	£86,285	
Parson Street	existing line	78,091	80,288	£328,666	£14,997	-			£343,663	£14,997	
Patchway	existing line	67,495	65,373	£257,598	-£1,508	-£260			£255,830	-£1,768	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	96,670	107,856	£481,997	£48,225	-			£530,222	£48,225	
Sea Mills	Severn Beach line	51,990	58,569	£134,653	£15,052	-			£149,705	£15,052	
Severn Beach	Severn Beach line	141,756	196,602	£153,590	£59,348	-£1,405			£211,533	£57,943	
Shirehampton	Severn Beach line	43,560	48,612	£118,797	£11,709	-£5,546			£124,960	£6,163	
St. Andrew's Road	Severn Beach line	6,109	8,733	£13,529	£4,398	-			£17,927	£4,398	
Stapleton Road	existing line	129,487	137,118	£480,643	£23,299	-£312			£503,630	£22,987	
Weston Milton	existing line	46,758	45,312	£233,118	-£1,212	-			£231,906	-£1,212	
Weston-super-Mare	existing line	1,095,611	1,059,604	£7,387,441	-£22,014	-£973			£7,364,454	-£22,987	
Worle	existing line	239,897	230,631	£1,650,737	-£16,686	-			£1,634,051	-£16,686	
Yate	existing line	295,000	284,709	£1,084,372	-£3,513	-£65			£1,080,794	-£3,578	
Yatton	existing line	377,647	364,301	£3,211,365	-£19,705	-£43,692			£3,147,968	-£63,397	
transfers from other existing stations						-£29,217				-£29,217	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	135,114	-	-	£399,391	5%	£20,710	£399,391	£399,391	
Portishead	NEW Portishead line	-	259,362	-	-	£2,311,104	8%	£180,626	£2,311,104	£2,311,104	
Portway P&R	NEW Severn Beach line	-	51,471	-	-	£160,339	7%	£10,616	£160,339	£160,339	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>21,730,933</b>	<b>22,132,130</b>	<b>£214,406,506</b>	<b>£746,550</b>	<b>-£218,943</b>	<b>£2,870,834</b>	<b>7%</b>	<b>£211,951</b>	<b>£217,834,164</b>	<b>£3,398,441</b>

## New Revenue

change in journeys: 401,197

net total at existing stations: £527,606

total at new stations: £2,870,834

all stations: £3,398,441

## Phase 1 – sensitivity test – local fares increased by 10%

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	88,778	96,295	£206,163	£16,018	-£586			£221,595	£15,432	
Bath Spa	existing line	5,560,338	5,385,725	£51,284,189	£220,992	-£1,149			£51,504,032	£219,843	
Bedminster	existing line	76,480	74,910	£293,362	£7,490	-			£300,852	£7,490	
Bristol Parkway	existing line	2,151,282	2,079,712	£42,177,735	-£80,801	-£5,519			£42,091,415	-£86,320	
Bristol Temple Meads	existing line	8,717,636	8,439,817	£94,247,689	£8,180	-£5,071			£94,250,798	£3,108	
Clifton Down	Severn Beach line	470,573	519,184	£1,144,667	£128,962	-			£1,273,629	£128,962	
Filton Abbey Wood	existing line	770,855	723,987	£3,392,143	-£36,522	-£2,026			£3,353,595	-£38,548	
Freshford	existing line	37,251	35,006	£200,713	-£3,146	-			£197,567	-£3,146	
Keynsham	existing line	305,702	321,140	£1,333,579	£74,562	-£434			£1,407,707	£74,128	
Lawrence Hill	existing line	103,050	107,255	£318,457	£17,055	-			£335,512	£17,055	
Montpelier	Severn Beach line	122,303	133,005	£496,945	£47,439	-			£544,384	£47,439	
Nailsea & Backwell	existing line	403,830	376,313	£2,694,153	-£28,078	-£122,687			£2,543,389	-£150,764	
Oldfield Park	existing line	252,572	262,142	£1,079,499	£79,310	-			£1,158,809	£79,310	
Parson Street	existing line	78,091	77,532	£328,666	£13,486	-			£342,152	£13,486	
Patchway	existing line	67,495	63,030	£257,598	-£4,240	-£260			£253,098	-£4,500	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	96,670	104,581	£481,997	£46,157	-			£528,154	£46,157	
Sea Mills	Severn Beach line	51,990	56,633	£134,653	£13,769	-			£148,422	£13,769	
Severn Beach	Severn Beach line	141,756	189,995	£153,590	£57,739	-£1,405			£209,924	£56,334	
Shirehampton	Severn Beach line	43,560	46,987	£118,797	£10,290	-£5,546			£123,541	£4,744	
St. Andrew's Road	Severn Beach line	6,109	8,430	£13,529	£4,216	-			£17,745	£4,216	
Stapleton Road	existing line	129,487	132,525	£480,643	£19,101	-£312			£499,433	£18,789	
Weston Milton	existing line	46,758	43,814	£233,118	-£2,806	-			£230,312	-£2,806	
Weston-super-Mare	existing line	1,095,611	1,028,589	£7,387,441	-£28,868	-£973			£7,357,599	-£29,842	
Worle	existing line	239,897	223,397	£1,650,737	-£24,058	-			£1,626,679	-£24,058	
Yate	existing line	295,000	274,933	£1,084,372	-£7,494	-£65			£1,076,813	-£7,559	
Yatton	existing line	377,647	353,820	£3,211,365	-£27,251	-£43,692			£3,140,422	-£70,943	
transfers from other existing stations						-£29,217				-£29,217	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	130,558	-	-	-	5%	£20,011	£385,925	£385,925	
Portishead	NEW Portishead line	-	251,679	-	-	-	8%	£175,275	£2,242,640	£2,242,640	
Portway P&R	NEW Severn Beach line	-	49,746	-	-	-	7%	£10,260	£154,963	£154,963	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>21,730,933</b>	<b>21,590,955</b>	<b>£214,406,506</b>	<b>£521,503</b>	<b>-£218,943</b>	<b>£2,783,528</b>	<b>7%</b>	<b>£205,546</b>	<b>£217,521,811</b>	<b>£3,086,088</b>

## New Revenue

change in journeys: -139,979

net total at existing stations: £302,560

total at new stations: £2,783,528

all stations: £3,086,088

## Phase 1 – sensitivity test – Severn Beach fares increased by £0.25

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	88,778	97,474	£206,163	£24,851	-£586			£230,428	£24,265	
Bath Spa	existing line	5,560,338	5,638,251	£51,284,189	£248,069	-£1,149			£51,531,109	£246,920	
Bedminster	existing line	76,480	80,430	£293,362	£12,125	-			£305,487	£12,125	
Bristol Parkway	existing line	2,151,282	2,151,984	£42,177,735	£3,266	-£5,519			£42,175,483	-£2,253	
Bristol Temple Meads	existing line	8,717,636	8,811,380	£94,247,689	£171,208	-£5,071			£94,413,826	£166,136	
Clifton Down	Severn Beach line	470,573	521,947	£1,144,667	£161,398	-			£1,306,065	£161,398	
Filton Abbey Wood	existing line	770,855	773,249	£3,392,143	£11,040	-£2,026			£3,401,157	£9,014	
Freshford	existing line	37,251	37,267	£200,713	£155	-			£200,868	£155	
Keynsham	existing line	305,702	343,552	£1,333,579	£91,782	-£434			£1,424,927	£91,348	
Lawrence Hill	existing line	103,050	109,648	£318,457	£26,407	-			£344,863	£26,407	
Montpelier	Severn Beach line	122,303	133,483	£496,945	£57,314	-			£554,259	£57,314	
Nailsea & Backwell	existing line	403,830	400,798	£2,694,153	-£11,824	-£122,687			£2,559,643	-£134,510	
Oldfield Park	existing line	252,572	280,226	£1,079,499	£94,414	-			£1,173,913	£94,414	
Parson Street	existing line	78,091	83,239	£328,666	£16,756	-			£345,422	£16,756	
Patchway	existing line	67,495	67,860	£257,598	£1,567	-£260			£258,905	£1,307	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	96,670	105,729	£481,997	£52,394	-			£534,390	£52,394	
Sea Mills	Severn Beach line	51,990	56,250	£134,653	£17,726	-			£152,379	£17,726	
Severn Beach	Severn Beach line	141,756	191,738	£153,590	£65,246	-£1,405			£217,431	£63,841	
Shirehampton	Severn Beach line	43,560	47,654	£118,797	£14,286	-£5,546			£127,536	£8,740	
St. Andrew's Road	Severn Beach line	6,109	8,700	£13,529	£4,744	-			£18,273	£4,744	
Stapleton Road	existing line	129,487	135,872	£480,643	£30,411	-£312			£510,742	£30,099	
Weston Milton	existing line	46,758	46,842	£233,118	£588	-			£233,705	£588	
Weston-super-Mare	existing line	1,095,611	1,092,792	£7,387,441	-£12,749	-£973			£7,373,719	-£13,722	
Worle	existing line	239,897	238,439	£1,650,737	-£8,243	-			£1,642,494	-£8,243	
Yate	existing line	295,000	295,236	£1,084,372	£1,176	-£65			£1,085,483	£1,110	
Yatton	existing line	377,647	375,578	£3,211,365	-£10,870	-£43,692			£3,156,802	-£54,562	
transfers from other existing stations						-£29,217				-£29,217	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	140,078	-	-	-	5%	£21,470	£414,064	£414,064	
Portishead	NEW Portishead line	-	267,753	-	-	-	8%	£186,469	£2,385,871	£2,385,871	
Portway P&R	NEW Severn Beach line	-	53,352	-	-	-	7%	£11,004	£166,196	£166,196	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>21,730,933</b>	<b>22,587,015</b>	<b>£214,406,506</b>	<b>£1,063,235</b>	<b>-£218,943</b>	<b>£2,966,131</b>	<b>7%</b>	<b>£218,943</b>	<b>£218,246,145</b>	<b>£3,810,423</b>

## New Revenue

change in journeys: 856,081

net total at existing stations: £844,291

total at new stations: £2,966,131

all stations: £3,810,423

## Phase 1 – sensitivity test – Severn Beach fares increased by £0.50

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations		FORECAST Net revenue at station	NEW revenue for railway		
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i>			<i>Transfer reven- -ue (incl in New station gross)</i>	
Avonmouth	Severn Beach line	88,778	93,360	£206,163	£26,764	-£586		£232,341	£26,178		
Bath Spa	existing line	5,560,338	5,634,442	£51,284,189	£251,855	-£1,149		£51,534,895	£250,706		
Bedminster	existing line	76,480	80,346	£293,362	£12,171	-		£305,533	£12,171		
Bristol Parkway	existing line	2,151,282	2,151,504	£42,177,735	£3,608	-£5,519		£42,175,824	-£1,912		
Bristol Temple Meads	existing line	8,717,636	8,784,265	£94,247,689	£181,852	-£5,071		£94,424,470	£176,780		
Clifton Down	Severn Beach line	470,573	499,453	£1,144,667	£171,041	-		£1,315,709	£171,041		
Filton Abbey Wood	existing line	770,855	772,216	£3,392,143	£11,644	-£2,026		£3,401,762	£9,618		
Freshford	existing line	37,251	37,251	£200,713	£165	-		£200,878	£165		
Keynsham	existing line	305,702	343,277	£1,333,579	£91,901	-£434		£1,425,046	£91,467		
Lawrence Hill	existing line	103,050	105,788	£318,457	£28,350	-		£346,807	£28,350		
Montpelier	Severn Beach line	122,303	128,853	£496,945	£59,377	-		£556,322	£59,377		
Nailsea & Backwell	existing line	403,830	400,623	£2,694,153	-£11,683	-£122,687		£2,559,784	-£134,369		
Oldfield Park	existing line	252,572	280,031	£1,079,499	£94,620	-		£1,174,119	£94,620		
Parson Street	existing line	78,091	83,194	£328,666	£16,783	-		£345,449	£16,783		
Patchway	existing line	67,495	67,802	£257,598	£1,609	-£260		£258,947	£1,349		
Pilning	existing line	213	213	£705	-	-		£705	-		
Redland	Severn Beach line	96,670	102,263	£481,997	£53,985	-		£535,982	£53,985		
Sea Mills	Severn Beach line	51,990	53,805	£134,653	£18,781	-		£153,434	£18,781		
Severn Beach	Severn Beach line	141,756	183,834	£153,590	£68,678	-£1,405		£220,863	£67,273		
Shirehampton	Severn Beach line	43,560	45,767	£118,797	£15,165	-£5,546		£128,416	£9,619		
St. Andrew's Road	Severn Beach line	6,109	8,442	£13,529	£4,870	-		£18,399	£4,870		
Stapleton Road	existing line	129,487	131,410	£480,643	£32,579	-£312		£512,910	£32,267		
Weston Milton	existing line	46,758	46,790	£233,118	£601	-		£233,719	£601		
Weston-super-Mare	existing line	1,095,611	1,092,155	£7,387,441	-£12,519	-£973		£7,373,948	-£13,493		
Worle	existing line	239,897	238,353	£1,650,737	-£8,167	-		£1,642,570	-£8,167		
Yate	existing line	295,000	295,108	£1,084,372	£1,281	-£65		£1,085,588	£1,215		
Yatton	existing line	377,647	375,424	£3,211,365	-£10,721	-£43,692		£3,156,952	-£54,413		
transfers from other existing stations						-£29,217			-£29,217		
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-		
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-		
Corsham	NEW existing line	-	-	-	-	-	-	-	-		
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-		
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-		
Horfield	NEW existing line	-	-	-	-	-	-	-	-		
Pill	NEW Portishead line	-	140,078	-	-	-	5%	£21,470	£414,064		
Portishead	NEW Portishead line	-	267,753	-	-	-	8%	£186,469	£2,385,871		
Portway P&R	NEW Severn Beach line	-	53,352	-	-	-	7%	£11,004	£166,196		
Saltford	NEW existing line	-	-	-	-	-	-	-	-		
<b>Totals</b>		<b>21,730,933</b>	<b>22,497,150</b>	<b>£214,406,506</b>	<b>£1,104,591</b>	<b>-£218,943</b>	<b>£2,966,131</b>	<b>7%</b>	<b>£218,943</b>	<b>£218,287,502</b>	<b>£3,851,779</b>

## New Revenue

change in journeys: 766,216

net total at existing stations: £885,647

total at new stations: £2,966,131

all stations: £3,851,779

## Phase 1 – sensitivity test – Severn Beach fares increased by £1.00

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	88,778	87,790	£206,163	£30,011	-£586			£235,588	£29,425	
Bath Spa	existing line	5,560,338	5,628,065	£51,284,189	£258,869	-£1,149			£51,541,909	£257,720	
Bedminster	existing line	76,480	80,225	£293,362	£12,253	-			£305,615	£12,253	
Bristol Parkway	existing line	2,151,282	2,150,764	£42,177,735	£4,220	-£5,519			£42,176,436	-£1,299	
Bristol Temple Meads	existing line	8,717,636	8,750,581	£94,247,689	£199,340	-£5,071			£94,441,958	£194,268	
Clifton Down	Severn Beach line	470,573	470,742	£1,144,667	£187,210	-			£1,331,877	£187,210	
Filton Abbey Wood	existing line	770,855	770,690	£3,392,143	£12,709	-£2,026			£3,402,827	£10,683	
Freshford	existing line	37,251	37,224	£200,713	£184	-			£200,897	£184	
Keynsham	existing line	305,702	342,867	£1,333,579	£92,112	-£434			£1,425,257	£91,678	
Lawrence Hill	existing line	103,050	100,491	£318,457	£31,714	-			£350,170	£31,714	
Montpelier	Severn Beach line	122,303	123,057	£496,945	£62,898	-			£559,843	£62,898	
Nailsea & Backwell	existing line	403,830	400,345	£2,694,153	-£11,427	-£122,687			£2,560,040	-£134,114	
Oldfield Park	existing line	252,572	279,702	£1,079,499	£95,002	-			£1,174,501	£95,002	
Parson Street	existing line	78,091	83,125	£328,666	£16,832	-			£345,497	£16,832	
Patchway	existing line	67,495	67,712	£257,598	£1,683	-£260			£259,021	£1,423	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	96,670	97,828	£481,997	£56,706	-			£538,702	£56,706	
Sea Mills	Severn Beach line	51,990	50,771	£134,653	£20,555	-			£155,208	£20,555	
Severn Beach	Severn Beach line	141,756	173,802	£153,590	£74,349	-£1,405			£226,534	£72,944	
Shirehampton	Severn Beach line	43,560	43,233	£118,797	£16,661	-£5,546			£129,912	£11,115	
St. Andrew's Road	Severn Beach line	6,109	8,089	£13,529	£5,084	-			£18,613	£5,084	
Stapleton Road	existing line	129,487	125,237	£480,643	£36,326	-£312			£516,658	£36,015	
Weston Milton	existing line	46,758	46,732	£233,118	£625	-			£233,743	£625	
Weston-super-Mare	existing line	1,095,611	1,091,102	£7,387,441	-£12,098	-£973			£7,374,370	-£13,071	
Worle	existing line	239,897	238,206	£1,650,737	-£8,024	-			£1,642,713	-£8,024	
Yate	existing line	295,000	294,899	£1,084,372	£1,472	-£65			£1,085,779	£1,407	
Yatton	existing line	377,647	375,168	£3,211,365	-£10,444	-£43,692			£3,157,229	-£54,136	
transfers from other existing stations						-£29,217				-£29,217	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	140,078	-	-	-	5%	£21,470	£414,064	£414,064	
Portishead	NEW Portishead line	-	267,753	-	-	-	8%	£186,469	£2,385,871	£2,385,871	
Portway P&R	NEW Severn Beach line	-	53,352	-	-	-	7%	£11,004	£166,196	£166,196	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>21,730,933</b>	<b>22,379,842</b>	<b>£214,406,506</b>	<b>£1,174,822</b>	<b>-£218,943</b>	<b>£2,966,131</b>	<b>7%</b>	<b>£218,943</b>	<b>£218,357,733</b>	<b>£3,922,010</b>

## New Revenue

change in journeys: 648,908

net total at existing stations: £955,879

total at new stations: £2,966,131

all stations: £3,922,010

## Phase 1 – sensitivity test – Severn Beach fares increased by £2.00

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway	
	Existing	Forecast <i>incl generated and existing</i>	Existing Revenue	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i> <i>Transfer reven- -ue (incl in New station gross)</i>				
Avonmouth	Severn Beach line	88,778	81,466	£206,163	£35,100	-£586			£240,677	£34,514	
Bath Spa	existing line	5,560,338	5,618,684	£51,284,189	£271,156	-£1,149			£51,554,195	£270,006	
Bedminster	existing line	76,480	80,078	£293,362	£12,384	-			£305,746	£12,384	
Bristol Parkway	existing line	2,151,282	2,149,788	£42,177,735	£5,246	-£5,519			£42,177,462	-£273	
Bristol Temple Meads	existing line	8,717,636	8,715,534	£94,247,689	£225,825	-£5,071			£94,468,443	£220,754	
Clifton Down	Severn Beach line	470,573	439,778	£1,144,667	£212,384	-			£1,357,052	£212,384	
Filton Abbey Wood	existing line	770,855	768,789	£3,392,143	£14,450	-£2,026			£3,404,567	£12,424	
Freshford	existing line	37,251	37,181	£200,713	£218	-			£200,931	£218	
Keynsham	existing line	305,702	342,348	£1,333,579	£92,460	-£434			£1,425,604	£92,025	
Lawrence Hill	existing line	103,050	94,257	£318,457	£37,140	-			£355,597	£37,140	
Montpelier	Severn Beach line	122,303	116,562	£496,945	£68,543	-			£565,488	£68,543	
Nailsea & Backwell	existing line	403,830	399,967	£2,694,153	-£10,994	-£122,687			£2,560,473	-£133,680	
Oldfield Park	existing line	252,572	279,210	£1,079,499	£95,675	-			£1,175,174	£95,675	
Parson Street	existing line	78,091	83,038	£328,666	£16,911	-			£345,577	£16,911	
Patchway	existing line	67,495	67,593	£257,598	£1,806	-£260			£259,144	£1,546	
Pilning	existing line	213	213	£705	-	-			£705	-	
Redland	Severn Beach line	96,670	92,851	£481,997	£61,065	-			£543,062	£61,065	
Sea Mills	Severn Beach line	51,990	47,478	£134,653	£23,339	-			£157,992	£23,339	
Severn Beach	Severn Beach line	141,756	163,232	£153,590	£82,984	-£1,405			£235,169	£81,579	
Shirehampton	Severn Beach line	43,560	40,365	£118,797	£19,017	-£5,546			£132,268	£13,471	
St. Andrew's Road	Severn Beach line	6,109	7,684	£13,529	£5,421	-			£18,950	£5,421	
Stapleton Road	existing line	129,487	117,961	£480,643	£42,351	-£312			£522,682	£42,039	
Weston Milton	existing line	46,758	46,670	£233,118	£665	-			£233,783	£665	
Weston-super-Mare	existing line	1,095,611	1,089,578	£7,387,441	-£11,369	-£973			£7,375,098	-£12,343	
Worle	existing line	239,897	237,986	£1,650,737	-£7,773	-			£1,642,964	-£7,773	
Yate	existing line	295,000	294,606	£1,084,372	£1,800	-£65			£1,086,107	£1,735	
Yatton	existing line	377,647	374,793	£3,211,365	-£9,959	-£43,692			£3,157,714	-£53,651	
transfers from other existing stations						-£29,217				-£29,217	
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-	
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-	
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-	
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-	
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-	
Pill	NEW Portishead line	-	140,078	-	-	-	5%	£21,470	£414,064	£414,064	
Portishead	NEW Portishead line	-	267,753	-	-	-	8%	£186,469	£2,385,871	£2,385,871	
Portway P&R	NEW Severn Beach line	-	53,352	-	-	-	7%	£11,004	£166,196	£166,196	
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-	
<b>Totals</b>		<b>21,730,933</b>	<b>22,248,871</b>	<b>£214,406,506</b>	<b>£1,285,843</b>	<b>-£218,943</b>	<b>£2,966,131</b>	<b>7%</b>	<b>£218,943</b>	<b>£218,468,754</b>	<b>£4,033,031</b>

## New Revenue

change in journeys: 517,938

net total at existing stations: £1,066,900

total at new stations: £2,966,131

all stations: £4,033,031

## Phase 1 – sensitivity test – combined scenario

## Station demand forecast

Annual Figures - based on NRTS 2010 and ORR 2011 values

Location	JOURNEYS		EXISTING Stations			NEW Stations			FORECAST Net revenue at station	NEW revenue for railway
	Existing <i>revised base</i>	Forecast <i>incl generated and existing</i>	Existing Revenue <i>revised base</i>	Change in Revenue due to service alterations	Generated Transfer Revenue <i>from existing to new stations</i>	Gross Revenue <i>total - including transfers revenue</i>	Trips through new stations previously using existing stations. <i>Proportion of demand at new station</i>	Transfer reven- -ue (incl in New station gross)		
Avonmouth	Severn Beach line	98,139	104,062	£218,299	£28,494	-£604			£246,190	£27,891
Bath Spa	existing line	5,819,749	5,901,418	£51,942,650	£285,510	-£1,166			£52,226,994	£284,344
Bedminster	existing line	78,009	82,008	£295,093	£12,322	-			£307,415	£12,322
Bristol Parkway	existing line	2,214,067	2,214,248	£42,284,774	£2,333	-£5,532			£42,281,576	-£3,198
Bristol Temple Meads	existing line	10,862,213	10,965,294	£117,063,271	£277,094	-£6,339			£117,334,026	£270,755
Clifton Down	Severn Beach line	521,719	557,485	£1,187,809	£176,821	-			£1,364,630	£176,821
Filton Abbey Wood	existing line	805,454	806,823	£3,452,945	£11,660	-£2,038			£3,462,567	£9,622
Freshford	existing line	39,575	39,576	£210,385	£165	-			£210,550	£165
Keynsham	existing line	332,560	373,936	£1,382,772	£98,862	-£446			£1,481,188	£98,416
Lawrence Hill	existing line	107,671	111,116	£322,244	£28,932	-			£351,176	£28,932
Montpelier	Severn Beach line	131,232	139,071	£503,946	£60,378	-			£564,324	£60,378
Nailsea & Backwell	existing line	442,801	438,879	£2,767,557	-£13,032	-£125,522			£2,629,003	-£138,554
Oldfield Park	existing line	280,557	312,295	£1,168,585	£108,258	-			£1,276,842	£108,258
Parson Street	existing line	80,239	85,562	£331,270	£17,059	-			£348,329	£17,059
Patchway	existing line	74,730	75,028	£271,588	£1,592	-£282			£272,898	£1,310
Pilning	existing line	213	213	£705	-	-			£705	-
Redland	Severn Beach line	104,985	111,744	£488,261	£54,857	-			£543,118	£54,857
Sea Mills	Severn Beach line	56,447	58,923	£139,430	£19,491	-			£158,921	£19,491
Severn Beach	Severn Beach line	161,590	211,998	£173,416	£76,952	-£1,416			£248,951	£75,536
Shirehampton	Severn Beach line	46,529	49,143	£122,706	£15,703	-£5,735			£132,674	£9,968
St. Andrew's Road	Severn Beach line	6,898	9,641	£14,493	£5,362	-			£19,855	£5,362
Stapleton Road	existing line	136,136	138,812	£486,931	£33,294	-£312			£519,913	£32,982
Weston Milton	existing line	51,348	51,379	£250,074	£597	-			£250,670	£597
Weston-super-Mare	existing line	1,192,759	1,188,648	£7,692,259	-£13,476	-£1,007			£7,677,776	-£14,483
Worle	existing line	264,318	262,464	£1,736,311	-£9,166	-			£1,727,146	-£9,166
Yate	existing line	327,161	327,269	£1,155,251	£1,280	-£69			£1,156,462	£1,212
Yatton	existing line	409,567	406,841	£3,298,469	-£12,051	-£45,288			£3,241,130	-£57,339
transfers from other existing stations						-£29,627				-£29,627
Ashley Down	NEW existing line	-	-	-	-	-	-	-	-	-
Ashton Gate	NEW Portishead line	-	-	-	-	-	-	-	-	-
Corsham	NEW existing line	-	-	-	-	-	-	-	-	-
Filton North	NEW Henbury line	-	-	-	-	-	-	-	-	-
Henbury	NEW Henbury line	-	-	-	-	-	-	-	-	-
Horfield	NEW existing line	-	-	-	-	-	-	-	-	-
Pill	NEW Portishead line	-	145,778	-	-	£425,851	5%	£22,102	£425,851	£425,851
Portishead	NEW Portishead line	-	289,979	-	-	£2,429,273	8%	£191,953	£2,429,273	£2,429,273
Portway P&R	NEW Severn Beach line	-	55,310	-	-	£168,714	7%	£11,327	£168,714	£168,714
Saltford	NEW existing line	-	-	-	-	-	-	-	-	-
<b>Totals</b>		<b>24,646,665</b>	<b>25,514,942</b>	<b>£238,961,495</b>	<b>£1,269,290</b>	<b>-£225,382</b>	<b>7%</b>	<b>£225,382</b>	<b>£243,058,868</b>	<b>£4,067,746</b>

## New Revenue

change in journeys: 868,277

net total at existing stations: £1,043,908

total at new stations: £3,023,838

all stations: £4,067,746



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## Appendix E

Economic Results (TEE Tables)



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## Appendix E Economic Results (TEE Tables)

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## Greater Bristol Metro Phase 1 – Transport Economic Efficiency (TEE) Table

<b>Consumer - Commuting user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	85,094	19,973		591		64,530	
Vehicle operating costs	6,412	6,412		0		0	
User charges	60,132	21,654		37,490		988	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - COMMUTING BENEFITS</b>	<b>151,638</b>	<b>48,039</b>		<b>38,081</b>		<b>65,518</b>	
<b>Consumer - Other user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	52,690	0		670		52,020	
Vehicle operating costs	0	0		0		0	
User charges	25,003	0		25,626		-623	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - OTHER BENEFITS</b>	<b>77,692</b>	<b>0</b>		<b>26,296</b>		<b>51,397</b>	
<b>Business</b>	<b>All Modes</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>
Travel Time	123,795	15,685	8,511	122	0	99,477	0
Vehicle operating costs	1,990	496	1,494	0	0	0	0
User charges	-16	0	0	143	0	-160	0
During Construction & Maintenance	0	0	0	0	0	0	0
<b>Subtotal</b>	<b>125,769</b>	<b>16,181</b>	<b>10,006</b>	<b>265</b>	<b>0</b>	<b>99,317</b>	<b>0</b>
<b>Private Sector Provider Impacts</b>							
Revenue	-34,440	-3,594		-80,645		49,799	
Operating costs	0	0		0		0	
Investment costs	0	0		0		0	
Grant/subsidy	28,221	0		0		28,221	
<b>Subtotal</b>	<b>-6,219</b>	<b>-3,594</b>		<b>-80,645</b>		<b>78,020</b>	
<b>Other business impacts</b>							
Developer contributions	0	0		0		0	
<b>NET BUSINESS IMPACT</b>	<b>119,550</b>						
<b>TOTAL</b>							
Present Value of Transport Economic Efficiency Benefits (TEE)	<b>348,881</b>						

### Public Accounts

<b>Local Government Funding</b>	<b>ALL MODES</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Revenue	0	0		0		0	
Operating Costs	1,411	0		0		1,411	
Investment Costs	81,140	0		0		81,140	
Developer Contributions	0	0		0		0	
Grant/Subsidy Payments	0	0		0		0	
<b>NET IMPACT</b>	<b>82,551</b>	<b>0</b>		<b>0</b>		<b>82,551</b>	
<b>Central Government Funding: Transport</b>	<b>ALL MODES</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Revenue	0	0		0		0	
Operating costs	28,221	0		0		28,221	
Investment costs	0	0		0		0	
Developer Contributions	0	0		0		0	
Grant/Subsidy Payments	28,221	0		0		28,221	
<b>NET IMPACT</b>	<b>56,442</b>	<b>0</b>		<b>0</b>		<b>56,442</b>	
<b>Central Government Funding: Non-Transport</b>							
Indirect Tax Revenues	1,351	4,633		-11,504		8,222	
<b>TOTALS</b>							
Broad Transport Budget	138,993	0		0		138,993	
Wider Public Finances	1,351	4,633		-11,504		8,222	

### Analysis of Monetised Costs and Benefits

Greenhouse Gases	2,006
Economic Efficiency: Consumer Users (Commuting)	151,638
Economic Efficiency: Consumer Users (Other)	77,692
Economic Efficiency: Business Users and Providers	119,550
Wider Public Finances (Indirect Taxation Revenues)	-1,351
<b>Present Value of Benefits (PVB)</b>	<b>349,537</b>
Broad Transport Budget	138,993
<b>Present Value of Costs (PVC)</b>	<b>138,993</b>
<b>OVERALL IMPACTS</b>	
<b>Net Present Value (NPV)</b>	<b>210,544</b>
<b>Benefit to Cost Ratio (BCR)</b>	<b>2.51</b>

TUBA PVB	349,537	
Noise	-	not assessed
Local Air Quality	-	not assessed
Journey Ambience	-	not assessed
Accidents	-	not assessed
Reliability	-	not assessed
Rail	-	not assessed
Wider Impacts	-	not assessed
Final PVB	349,537	
NPV	210,544	
<b>BCR</b>	<b>2.51</b>	

Benefits appear as positive numbers, while costs appear as negative numbers. All entries are present values discounted to 2010, in 2010 prices

Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

## Greater Bristol Metro Phase 1 – Transport Economic Efficiency (TEE) Table

### Capital cost sensitivity test – increase costs by 10%

<b>Consumer - Commuting user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	85,094	19,973		591		64,530	
Vehicle operating costs	6,412	6,412		0		0	
User charges	60,132	21,654		37,490		988	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - COMMUTING BENEFITS</b>	<b>151,638</b>	<b>48,039</b>		<b>38,081</b>		<b>65,518</b>	
<b>Consumer - Other user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	52,690	0		670		52,020	
Vehicle operating costs	0	0		0		0	
User charges	25,003	0		25,626		-623	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - OTHER BENEFITS</b>	<b>77,692</b>	<b>0</b>		<b>26,296</b>		<b>51,397</b>	
<b>Business</b>	<b>All Modes</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>
Travel Time	123,795	15,685	8,511	122	0	99,477	0
Vehicle operating costs	1,990	496	1,494	0	0	0	0
User charges	-16	0	0	143	0	-160	0
During Construction & Maintenance	0	0	0	0	0	0	0
<b>Subtotal</b>	<b>125,769</b>	<b>16,181</b>	<b>10,006</b>	<b>265</b>	<b>0</b>	<b>99,317</b>	<b>0</b>
<b>Private Sector Provider Impacts</b>							
Revenue	-34,440	-3,594		-80,645		49,799	
Operating costs	0	0		0		0	
Investment costs	0	0		0		0	
Grant/subsidy	28,221	0		0		28,221	
<b>Subtotal</b>	<b>-6,219</b>	<b>-3,594</b>		<b>-80,645</b>		<b>78,020</b>	
<b>Other business Impacts</b>							
Developer contributions	0	0		0		0	
<b>NET BUSINESS IMPACT</b>	<b>119,550</b>						
<b>TOTAL</b>							
Present Value of Transport Economic Efficiency Benefits (TEE)	<b>348,881</b>						

### Public Accounts

<b>Local Government Funding</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating Costs	1,411	0	0	1,411
Investment Costs	89,254	0	0	89,254
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	0	0	0	0
<b>NET IMPACT</b>	<b>90,665</b>	<b>0</b>	<b>0</b>	<b>90,665</b>
<b>Central Government Funding: Transport</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating costs	28,221	0	0	28,221
Investment costs	0	0	0	0
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	28,221	0	0	28,221
<b>NET IMPACT</b>	<b>56,442</b>	<b>0</b>	<b>0</b>	<b>56,442</b>
<b>Central Government Funding: Non-Transport</b>				
Indirect Tax Revenues	1,351	4,633	-11,504	8,222
<b>TOTALS</b>				
Broad Transport Budget	147,107	0	0	147,107
Wider Public Finances	1,351	4,633	-11,504	8,222

### Analysis of Monetised Costs and Benefits

Greenhouse Gases	2,006
Economic Efficiency: Consumer Users (Commuting)	151,638
Economic Efficiency: Consumer Users (Other)	77,692
Economic Efficiency: Business Users and Providers	119,550
Wider Public Finances (Indirect Taxation Revenues)	-1,351
<b>Present Value of Benefits (PVB)</b>	<b>349,537</b>
Broad Transport Budget	147,107
<b>Present Value of Costs (PVC)</b>	<b>147,107</b>
<b>OVERALL IMPACTS</b>	
<b>Net Present Value (NPV)</b>	<b>202,430</b>
<b>Benefit to Cost Ratio (BCR)</b>	<b>2.38</b>

TUBA PVB	349,537	
Noise	-	not assessed
Local Air Quality	-	not assessed
Journey Ambience	-	not assessed
Accidents	-	not assessed
Reliability	-	not assessed
Rail	-	not assessed
Wider Impacts	-	not assessed
Final PVB	349,537	
NPV	202,430	
<b>BCR</b>	<b>2.38</b>	

Benefits appear as positive numbers, while costs appear as negative numbers. All entries are present values discounted to 2010, in 2010 prices

Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

## Greater Bristol Metro Phase 1 – Transport Economic Efficiency (TEE) Table

### Capital cost sensitivity test – increase costs by 20%

<b>Consumer - Commuting user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	85,094	19,973		591		64,530	
Vehicle operating costs	6,412	6,412		0		0	
User charges	60,132	21,654		37,490		988	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - COMMUTING BENEFITS</b>	<b>151,638</b>	<b>48,039</b>		<b>38,081</b>		<b>65,518</b>	
<b>Consumer - Other user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	52,690	0		670		52,020	
Vehicle operating costs	0	0		0		0	
User charges	25,003	0		25,626		-623	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - OTHER BENEFITS</b>	<b>77,692</b>	<b>0</b>		<b>26,296</b>		<b>51,397</b>	
<b>Business</b>	<b>All Modes</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>
Travel Time	123,795	15,685	8,511	122	0	99,477	0
Vehicle operating costs	1,990	496	1,494	0	0	0	0
User charges	-16	0	0	143	0	-160	0
During Construction & Maintenance	0	0	0	0	0	0	0
<b>Subtotal</b>	<b>125,769</b>	<b>16,181</b>	<b>10,006</b>	<b>265</b>	<b>0</b>	<b>99,317</b>	<b>0</b>
<b>Private Sector Provider Impacts</b>							
Revenue	-34,440	-3,594		-80,645		49,799	
Operating costs	0	0		0		0	
Investment costs	0	0		0		0	
Grant/subsidy	28,221	0		0		28,221	
<b>Subtotal</b>	<b>-6,219</b>	<b>-3,594</b>		<b>-80,645</b>		<b>78,020</b>	
<b>Other business Impacts</b>							
Developer contributions	0	0		0		0	
<b>NET BUSINESS IMPACT</b>	<b>119,550</b>						
<b>TOTAL</b>							
Present Value of Transport Economic Efficiency Benefits (TEE)	<b>348,881</b>						

### Public Accounts

<b>Local Government Funding</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating Costs	1,411	0	0	1,411
Investment Costs	97,368	0	0	97,368
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	0	0	0	0
<b>NET IMPACT</b>	<b>98,779</b>	<b>0</b>	<b>0</b>	<b>98,779</b>
<b>Central Government Funding: Transport</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating costs	28,221	0	0	28,221
Investment costs	0	0	0	0
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	28,221	0	0	28,221
<b>NET IMPACT</b>	<b>56,442</b>	<b>0</b>	<b>0</b>	<b>56,442</b>
<b>Central Government Funding: Non-Transport</b>				
Indirect Tax Revenues	1,351	4,633	-11,504	8,222
<b>TOTALS</b>				
Broad Transport Budget	155,221	0	0	155,221
Wider Public Finances	1,351	4,633	-11,504	8,222

### Analysis of Monetised Costs and Benefits

Greenhouse Gases	2,006
Economic Efficiency: Consumer Users (Commuting)	151,638
Economic Efficiency: Consumer Users (Other)	77,692
Economic Efficiency: Business Users and Providers	119,550
Wider Public Finances (Indirect Taxation Revenues)	-1,351
<b>Present Value of Benefits (PVB)</b>	<b>349,537</b>
Broad Transport Budget	155,221
<b>Present Value of Costs (PVC)</b>	<b>155,221</b>
<b>OVERALL IMPACTS</b>	
<b>Net Present Value (NPV)</b>	<b>194,316</b>
<b>Benefit to Cost Ratio (BCR)</b>	<b>2.25</b>

TUBA PVB	349,537	
Noise	-	not assessed
Local Air Quality	-	not assessed
Journey Ambience	-	not assessed
Accidents	-	not assessed
Reliability	-	not assessed
Rail	-	not assessed
Wider Impacts	-	not assessed
Final PVB	349,537	
NPV	194,316	
<b>BCR</b>	<b>2.25</b>	

Benefits appear as positive numbers, while costs appear as negative numbers. All entries are present values discounted to 2010, in 2010 prices

Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

## Greater Bristol Metro Phase 1 – Transport Economic Efficiency (TEE) Table

### Capital cost sensitivity test – increase costs by 30%

<b>Consumer - Commuting user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	85,094	19,973		591		64,530	
Vehicle operating costs	6,412	6,412		0		0	
User charges	60,132	21,654		37,490		988	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - COMMUTING BENEFITS</b>	<b>151,638</b>	<b>48,039</b>		<b>38,081</b>		<b>65,518</b>	
<b>Consumer - Other user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	52,690	0		670		52,020	
Vehicle operating costs	0	0		0		0	
User charges	25,003	0		25,626		-623	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - OTHER BENEFITS</b>	<b>77,692</b>	<b>0</b>		<b>26,296</b>		<b>51,397</b>	
<b>Business</b>	<b>All Modes</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>
Travel Time	123,795	15,685	8,511	122	0	99,477	0
Vehicle operating costs	1,990	496	1,494	0	0	0	0
User charges	-16	0	0	143	0	-160	0
During Construction & Maintenance	0	0	0	0	0	0	0
<b>Subtotal</b>	<b>125,769</b>	<b>16,181</b>	<b>10,006</b>	<b>265</b>	<b>0</b>	<b>99,317</b>	<b>0</b>
<b>Private Sector Provider Impacts</b>							
Revenue	-34,440	-3,594		-80,645		49,799	
Operating costs	0	0		0		0	
Investment costs	0	0		0		0	
Grant/subsidy	28,221	0		0		28,221	
<b>Subtotal</b>	<b>-6,219</b>	<b>-3,594</b>		<b>-80,645</b>		<b>78,020</b>	
<b>Other business Impacts</b>							
Developer contributions	0	0		0		0	
<b>NET BUSINESS IMPACT</b>	<b>119,550</b>						
<b>TOTAL</b>							
Present Value of Transport Economic Efficiency Benefits (TEE)	<b>348,881</b>						

### Public Accounts

<b>Local Government Funding</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating Costs	1,411	0	0	1,411
Investment Costs	105,482	0	0	105,482
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	0	0	0	0
<b>NET IMPACT</b>	<b>106,893</b>	<b>0</b>	<b>0</b>	<b>106,893</b>
<b>Central Government Funding: Transport</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating costs	28,221	0	0	28,221
Investment costs	0	0	0	0
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	28,221	0	0	28,221
<b>NET IMPACT</b>	<b>56,442</b>	<b>0</b>	<b>0</b>	<b>56,442</b>
<b>Central Government Funding: Non-Transport</b>				
Indirect Tax Revenues	1,351	4,633	-11,504	8,222
<b>TOTALS</b>				
Broad Transport Budget	163,335	0	0	163,335
Wider Public Finances	1,351	4,633	-11,504	8,222

### Analysis of Monetised Costs and Benefits

Greenhouse Gases	2,006
Economic Efficiency: Consumer Users (Commuting)	151,638
Economic Efficiency: Consumer Users (Other)	77,692
Economic Efficiency: Business Users and Providers	119,550
Wider Public Finances (Indirect Taxation Revenues)	-1,351
<b>Present Value of Benefits (PVB)</b>	<b>349,537</b>
Broad Transport Budget	163,335
<b>Present Value of Costs (PVC)</b>	<b>163,335</b>
<b>OVERALL IMPACTS</b>	
<b>Net Present Value (NPV)</b>	<b>186,202</b>
<b>Benefit to Cost Ratio (BCR)</b>	<b>2.14</b>

TUBA PVB	349,537	
Noise	-	not assessed
Local Air Quality	-	not assessed
Journey Ambience	-	not assessed
Accidents	-	not assessed
Reliability	-	not assessed
Rail	-	not assessed
Wider Impacts	-	not assessed
Final PVB	349,537	
NPV	186,202	
<b>BCR</b>	<b>2.14</b>	

Benefits appear as positive numbers, while costs appear as negative numbers. All entries are present values discounted to 2010, in 2010 prices

Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

## Greater Bristol Metro Phase 1 – Transport Economic Efficiency (TEE) Table

### Capital cost sensitivity test – increase costs by 50%

<b>Consumer - Commuting user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	85,094	19,973		591		64,530	
Vehicle operating costs	6,412	6,412		0		0	
User charges	60,132	21,654		37,490		988	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - COMMUTING BENEFITS</b>	<b>151,638</b>	<b>48,039</b>		<b>38,081</b>		<b>65,518</b>	
<b>Consumer - Other user benefits</b>	<b>All Modes</b>	<b>Road</b>		<b>Bus</b>		<b>Rail</b>	
Travel Time	52,690	0		670		52,020	
Vehicle operating costs	0	0		0		0	
User charges	25,003	0		25,626		-623	
During Construction & Maintenance	0	0		0		0	
<b>NET CONSUMER - OTHER BENEFITS</b>	<b>77,692</b>	<b>0</b>		<b>26,296</b>		<b>51,397</b>	
<b>Business</b>	<b>All Modes</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>	<b>Personal</b>	<b>Freight</b>
Travel Time	123,795	15,685	8,511	122	0	99,477	0
Vehicle operating costs	1,990	496	1,494	0	0	0	0
User charges	-16	0	0	143	0	-160	0
During Construction & Maintenance	0	0	0	0	0	0	0
<b>Subtotal</b>	<b>125,769</b>	<b>16,181</b>	<b>10,006</b>	<b>265</b>	<b>0</b>	<b>99,317</b>	<b>0</b>
<b>Private Sector Provider Impacts</b>							
Revenue	-34,440	-3,594		-80,645		49,799	
Operating costs	0	0		0		0	
Investment costs	0	0		0		0	
Grant/subsidy	28,221	0		0		28,221	
<b>Subtotal</b>	<b>-6,219</b>	<b>-3,594</b>		<b>-80,645</b>		<b>78,020</b>	
<b>Other business Impacts</b>							
Developer contributions	0	0		0		0	
<b>NET BUSINESS IMPACT</b>	<b>119,550</b>						
<b>TOTAL</b>							
Present Value of Transport Economic Efficiency Benefits (TEE)	<b>348,881</b>						

### Public Accounts

<b>Local Government Funding</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating Costs	1,411	0	0	1,411
Investment Costs	121,710	0	0	121,710
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	0	0	0	0
<b>NET IMPACT</b>	<b>123,121</b>	<b>0</b>	<b>0</b>	<b>123,121</b>
<b>Central Government Funding: Transport</b>	<b>ALL MODES</b>	<b>Road</b>	<b>Bus</b>	<b>Rail</b>
Revenue	0	0	0	0
Operating costs	28,221	0	0	28,221
Investment costs	0	0	0	0
Developer Contributions	0	0	0	0
Grant/Subsidy Payments	28,221	0	0	28,221
<b>NET IMPACT</b>	<b>56,442</b>	<b>0</b>	<b>0</b>	<b>56,442</b>
<b>Central Government Funding: Non-Transport</b>				
Indirect Tax Revenues	1,351	4,633	-11,504	8,222
<b>TOTALS</b>				
Broad Transport Budget	179,563	0	0	179,563
Wider Public Finances	1,351	4,633	-11,504	8,222

### Analysis of Monetised Costs and Benefits

Greenhouse Gases	2,006
Economic Efficiency: Consumer Users (Commuting)	151,638
Economic Efficiency: Consumer Users (Other)	77,692
Economic Efficiency: Business Users and Providers	119,550
Wider Public Finances (Indirect Taxation Revenues)	-1,351
<b>Present Value of Benefits (PVB)</b>	<b>349,537</b>
Broad Transport Budget	179,563
<b>Present Value of Costs (PVC)</b>	<b>179,563</b>
<b>OVERALL IMPACTS</b>	
<b>Net Present Value (NPV)</b>	<b>169,974</b>
<b>Benefit to Cost Ratio (BCR)</b>	<b>1.95</b>

TUBA PVB	349,537	
Noise	-	not assessed
Local Air Quality	-	not assessed
Journey Ambience	-	not assessed
Accidents	-	not assessed
Reliability	-	not assessed
Rail	-	not assessed
Wider Impacts	-	not assessed
Final PVB	349,537	
NPV	169,974	
<b>BCR</b>	<b>1.95</b>	

Benefits appear as positive numbers, while costs appear as negative numbers. All entries are present values discounted to 2010, in 2010 prices

Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

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