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Rotherwas Rail High Level Business Case Study

Final Report for Herefordshire Council

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Executive summary

The study examined the high level business case for creation of a local rail service between Leominster and Rotherwas / Holme Lacy, via Hereford. This would involve reinstating the railway on the abandoned formation and provision of new stations. The objectives of the initiative are to improve public transport access to the expanding Rotherwas Industrial Estate which has recently been designated an Enterprise Zone.

The operations assessment concluded that it would be reasonably practical to fit a half hourly service between Rotherwas and Leominster. However, the additional time taken to reach Holme Lacy produces timetable constrictions and numerous conflicts so it would be more difficult to achieve with the same rolling stock. The operating costs were estimated as between £2.2m and £2.3m per annum.

Similarly, the physical assessment revealed that it would be reasonably practical to create a turn-back facility at Leominster Station (on the southbound platform) and to recreate the railway from the Main Line north of the former Rotherwas Junction along the former alignment to a station at either the North Magazine site or west of Vincent Cary Road. This would require closing Fir Tree Lane. Capital costs were estimated as around £10m.

The physical assessment noted the significant difficulties of reinstating the railway beyond Vincent Cary Road due to; encroachment of the alignment in several places; difficulties associated with level crossings (or significant costs to avoid them) at Vincent Cary Road and Chapel Lane; lost bridges at Fordshill Road and over the B4399 and; filled in tunnel under Rotherwas Park Wood and the B4399. The costs were broadly estimated as around £58m.

The high level business case assessment estimated demand and revenues and user and non-user benefits for passengers using existing stations, and passengers attracted to and from new stations. The annual demand forecast for the Rotherwas – Leominster option is between 138k and 188k passenger journeys, generating between £0.43m and £0.62m revenue. The Holme Lacy – Rotherwas service was forecast to generate between 147k and 197k passenger journeys per annum and between £0.46m and £0.64m revenue.

The forecast revenues fall short of the operating costs by a large margin (£1.7m per annum). The high costs of the Holme Lacy extension are not covered by benefits in the appraisal and there is no economic case for that scheme. The Leominster – Rotherwas scheme has a relatively weak economic case. Wider economic benefits might be used to argue for government funding, but the ongoing annual subsidy costs would provide a significant barrier to most avenues of funding.

Contents

1 Introduction

1.1 Background

Jacobs was appointed by Herefordshire Council to undertake a study into the high level business case for a local rail service between Leominster and Rotherwas / Holme Lacy via Hereford. The study has been commissioned in response to a proposal from the local community regarding opportunities to re-introduce rail into Rotherwas and on to Holme Lacy. The recent designation of Rotherwas as an enterprise zone has already raised the profile of access issues impacting the future development of the estate.

Key elements of the proposal are shown in Figure 1 and are:

- *re-instating the rail line into Rotherwas (and potentially on to Holme Lacy) and providing a signalised junction with the Hereford to Newport line.*
- *providing a new passenger rail station and parking facilities at Rotherwas (and potentially at Holme Lacy).*
- *investigating potential for rail freight access within the Estate and associated with the re-instated line.*
- *provision of additional platform, signalling and car parking at Leominster rail station.*
- *provision of an half hourly rail service operating locally between Leominster and Rotherwas (and potentially Holme Lacy).*

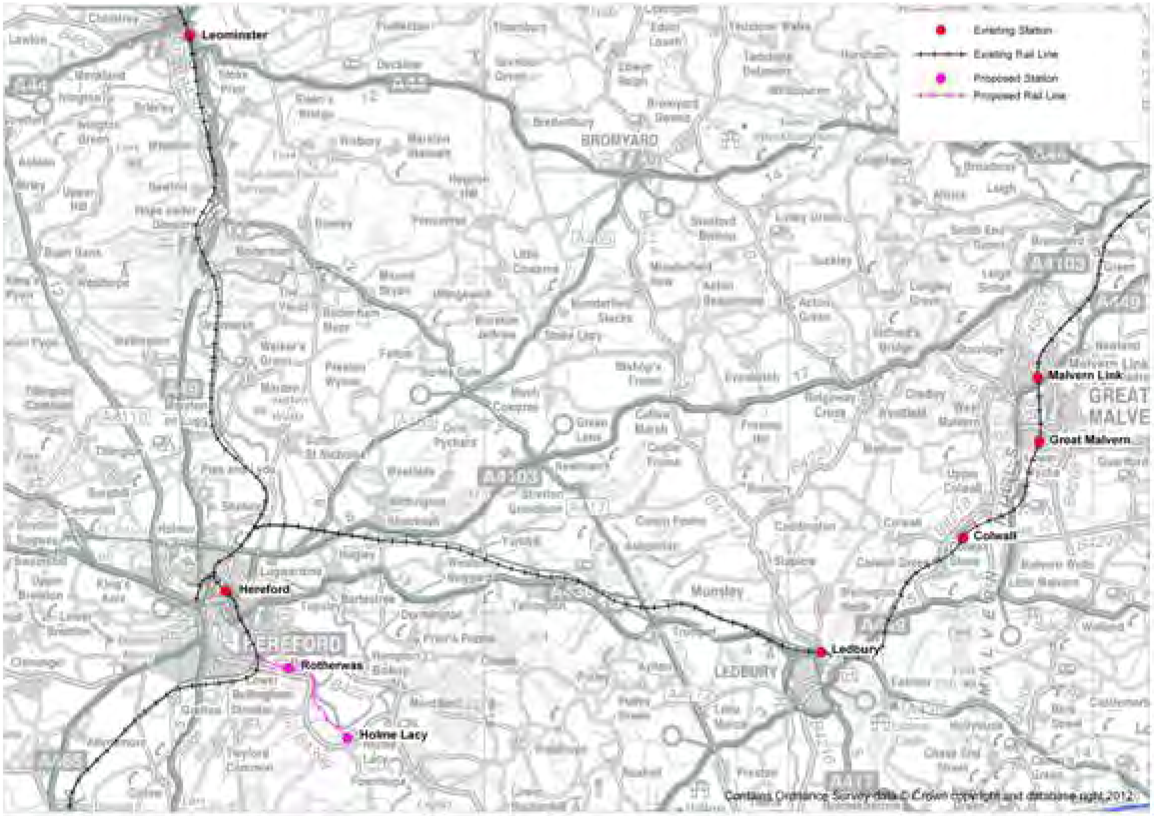

Figure 1 Study Area Plan.

1.2 Study Requirements

The study[1] was required to undertake a "quick but authoritative assessment of the proposal so that it can determine the merits or otherwise of pursuing the proposal further." Also, that... "The business case will need to demonstrate compatibility with normal rail industry standards and major scheme business case criteria to provide confidence in its recommendations."

The outputs of the study were identified as:

- *likely scheme costs (both capital and revenue), broken down into the various scheme elements, providing a range if the proposal does include sufficient detail.*
- *Barriers / risks to scheme delivery (such as land availability, environmental issues etc).*
- *levels of demand for the new service including patronage predictions.*
- *any ongoing subsidies required to maintain a service.*
- *whether any elements of the proposal may have greater merits on their own and if so which elements and why.*
- *sources of funding and a view on the likelihood of such funds being attracted by the proposal.*

1.3 Report Structure

Following this introduction Section 2 provides the results of the technical assessments of the scheme proposals, Section 3 provides the results of the demand and revenue forecasting and Section 4 presents the scheme appraisal including user and non-user benefits, cost benefit analysis and sensitivity testing. Section 5 presents the study conclusions and recommendations.

[1] From Study Brief issued by Herefordshire Council, 2.7.2012

2 Technical Assessment

2.1 Introduction

To assess the practicality of the proposal and the technical issues an assessment of the operations and infrastructure requirements has been undertaken. This informs the business case in terms of the timetable for modelling and the costs. The work has been undertaken using available information including, background reports and previous studies and existing train timetable and operations planning rules.

2.2 Operations Assessment

The timetable for the new service would need to fit around the existing services[2] which are;

- *1.5 trains per hour (tph) Arriva Trains Wales South Wales – Manchester / North Wales service;*
- *Hourly London Midland Hereford – Birmingham service, and;*
- *Occasional Great Western Hereford – Worcester – London Paddington service.*

Planning the new service took account of the 2 minute specified dwell time at Hereford and turn-back of the existing London Midland Birmingham service. The main line north and south of Hereford is controlled by Absolute Block Signalling (ABS) and no specific headway rules are provided. It was assumed that there would be a need to provide additional signalling to accommodate turning back at Leominster and connecting at Rotherwas.

2.2.1 Option 1: Leominster - Rotherwas

Existing train timings were used for the Leominster – Hereford section and 5 minutes was assumed for the 4 kilometre section from Hereford to Rotherwas. A standard hour timetable was devised with timings shown in Table 2-A. This was checked across the operating day (Monday – Friday) and observed to conflict with five services southbound and one service northbound. The conflicts are largely in the peak hours which would need to be resolved by re-timing if the proposal were taken forward. A half hour service can operate with two trains with layovers of 10 minutes at Leominster and 7 minutes at Rotherwas.

[2] Note that the proposed signalling upgrade at Hereford Station may increase flexibility and reduce dwell times at the station – especially for the Hereford – Birmingham service. However, no detailed timetables were provided for the study.

Location	Timings Train 1	Timings Train 2
Leominster Depart	xx:22	xx:58
Hereford Arrive	xx:38	xx:14
Hereford Depart	xx:40	xx:16
Rotherwas Arrive	xx:45	xx:21
Rotherwas Depart	xx:52	xx:28
Hereford Arrive	xx:57	xx:33
Hereford Depart	xx:59	xx:35
Leominster Arrive	xx:12	xx:48

Table 2-A Standard Hour Timetable – Leominster – Rotherwas

2.2.2 Option 2: Leominster – Holme Lacy

Assuming a further 5 minute journey time for the 4 kilometre section between Rotherwas and Holme Lacy the journey times between Leominster and Holme Lacy would be 28 minutes southbound and 25 minutes northbound leaving only 7 minutes for the two turnrounds. That timetable would therefore be very tight and is difficult to fit within the standard hour without affecting other services. The timings shown in Table 2-B follows 2 minutes behind the southbound Arriva Trains Wales service that doesn't call at Leominster and is 2 minutes in front of the northbound London Midland service in the busiest hour. This is unlikely to be acceptable due to small margins between conflicting moves.

Across the operating day the southbound service conflicts with five other services particularly in the morning peak and the northbound train conflicts with London Midland services throughout the day. This service would require a major recast of the timetables and / or cannot be delivered in advance of resignaling of the Hereford Station area and the improved turnback of the Birrmingham – Hereford service.

Location	Timings Train 1	Timings Train 2
Leominster Depart	xx:28	xx:55
Hereford Arrive	xx:44	xx:11
Hereford Depart	xx:46	xx:13
Rotherwas	xx:51	xx:18
Holme Lacy Arrive	xx:56	xx:23
Holme Lacy Depart	xx:59	xx:26
Rotherwas	xx:04	xx:31
Hereford Arrive	xx:09	xx:36
Hereford Depart	xx:11	xx:38
Leominster Arrive	xx:24	xx:51

Table 2-B Standard Hour Timetable – Leominster – Holme Lacy

2.3 Operating Costs

The timetable assumptions have been input to Jacobs operating cost model to provide estimated costs for the new service options. This model was developed in partnership with Arriva Trains Wales for a previous study in Spring 2011. The analysis assumed the service is provided with Class 150 (Sprinter) trains for 14 hours a day between Monday and Saturday. No Sunday service was assumed as it is known that public transport flows to / from Rotherwas are very low at the weekend. The breakdown of the operating costs is shown in Table 2-C.

Element	Leominster – Rotherwas £'000's	Leominster – Holme Lacy £'000's
Train Leasing Costs	£630	£630
Staff Costs	£568	£568
Servicing and Light Maintenance	£494	£556
Fuel	£227	£255
Network Rail Capacity Charges	£83	£83
Station Running Costs	£33	£66
Retail Commission	£45	£45
Track Usage Charges	£30	£34
Income related overheads	£15	£15
Traincrew management and HQ overheads	£57	£57
Totals	**£2,182**	**£2,309**

Table 2-C Estimated Operating Costs (2010/11 prices and values)

2.4 Infrastructure Requirements

The Hereford – Ross – Gloucester rail line was opened in 1855 and operated until 2nd November 1964. Originally built to broad gauge it was converted to standard gauge in 1869. There was a station at Holme Lacy (see picture) and the line connected to the main Newport – Hereford railway at Rotherwas Junction. The abandoned line is still identifiable in the landscape (Figure 2). The Rotherwas Industrial Estate (formerly the munitions factory) straddles the abandoned rail alignment.

Leominster lies 12.5 miles north of Hereford. The Rotherwas Enterprise Zone lies over two miles to the South East of Hereford City Centre. It is situated south of the River Wye and east of the railway which are key barriers to transport and access.

The assessment of the infrastructure requirements for the options has been based on available maps, background reports, a site visit and advice from Network Rail. A key background report was the 'Atkins Herefordshire Rail Study, Infrastructure Improvements Report, January 2000' – key sections of which are summarised in Appendix A.

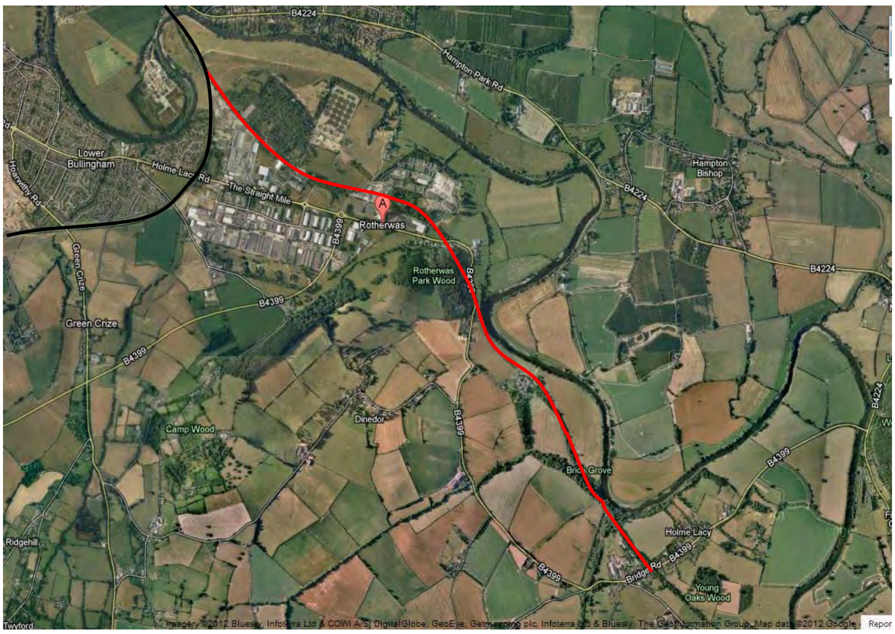

Figure 2: Abandoned Rail Line between Rotherwas Junction and Holme Lacy

For both options the train service would need to turn at Leominster. A new turn-back facility would be required. It would be possible for creation of a south facing bay platform on the east side of the existing southbound platform. That would minimise access costs as it would be served by the existing footbridge and there is space for the facility. Figures 3 and 4 show the existing station facilities.

Figure 3 Leominster Station Access to Southbound Platform

Figure 4 Leominster Station Looking South

For both options the new junction with the main line at Rotherwas and re-creation of the rail line along the previous formation to a new station to serve the Industrial Estate is required. The Atkins Rail Freight infrastructure study noted the need for an embankment to a new junction to the north of the curve and associated signalling. Network rail identified that signalling costs could be significantly reduced if the scheme was introduced within the signalling renewal of the Hereford Area. Studies into that investment are ongoing and have reached the GRIP 3 stage.

A site visit was undertaken on 26th July 2012 and Figure 5 shows the alignment and key locations referred to in the assessment.

It was observed that the section of the alignment to the west of Fir Tree Lane was abandoned but identifiable and not too overgrown (see Figure 6). Access to the north of the rail line has recently been improved though the access roads leading to Vincent Cary Road and there was a gate across Fir Tree Lane. It is assumed that Fir Tree Lane could be severed by the railway - to avoid the cost of, and issues associated with, a new level crossing.

Between Fir Tree Lane and Vincent Cary Road the abandoned alignment is identifiable but very overgrown (See Figure 7). There is hard standing encroaching the alignment on the east side of Fir Tree Lane. A station could be built to the West of Vincent Cary Road to avoid crossing the road. Access to the existing business park and new development sites would be via Vincent Cary Road. It is assumed that a single platform is required for the station and that it would require shelter, passenger information and CCTV. It is assumed that, though the trains are not timetabled to pass on the new section of line, there is likely to be a need to store a train on the branch rather than block the main line in the event of timetable perturbations.

For the option to extend the service to Holme Lacy significantly more infrastructure would be required. The site visit observed that a level crossing would be required at Vincent Cary Road to continue to the East. This might not be acceptable and the alternative would be to construct an embankment and bridge to cross the highway. Between Vincent Cary Road and Chapel Lane the abandoned alignment is identifiable and very overgrown (see Figure 8). At Chapel Lane a second level crossing would need to be reinstated (or significant works required for extension of the embankment and provision of a new bridge over the highway).

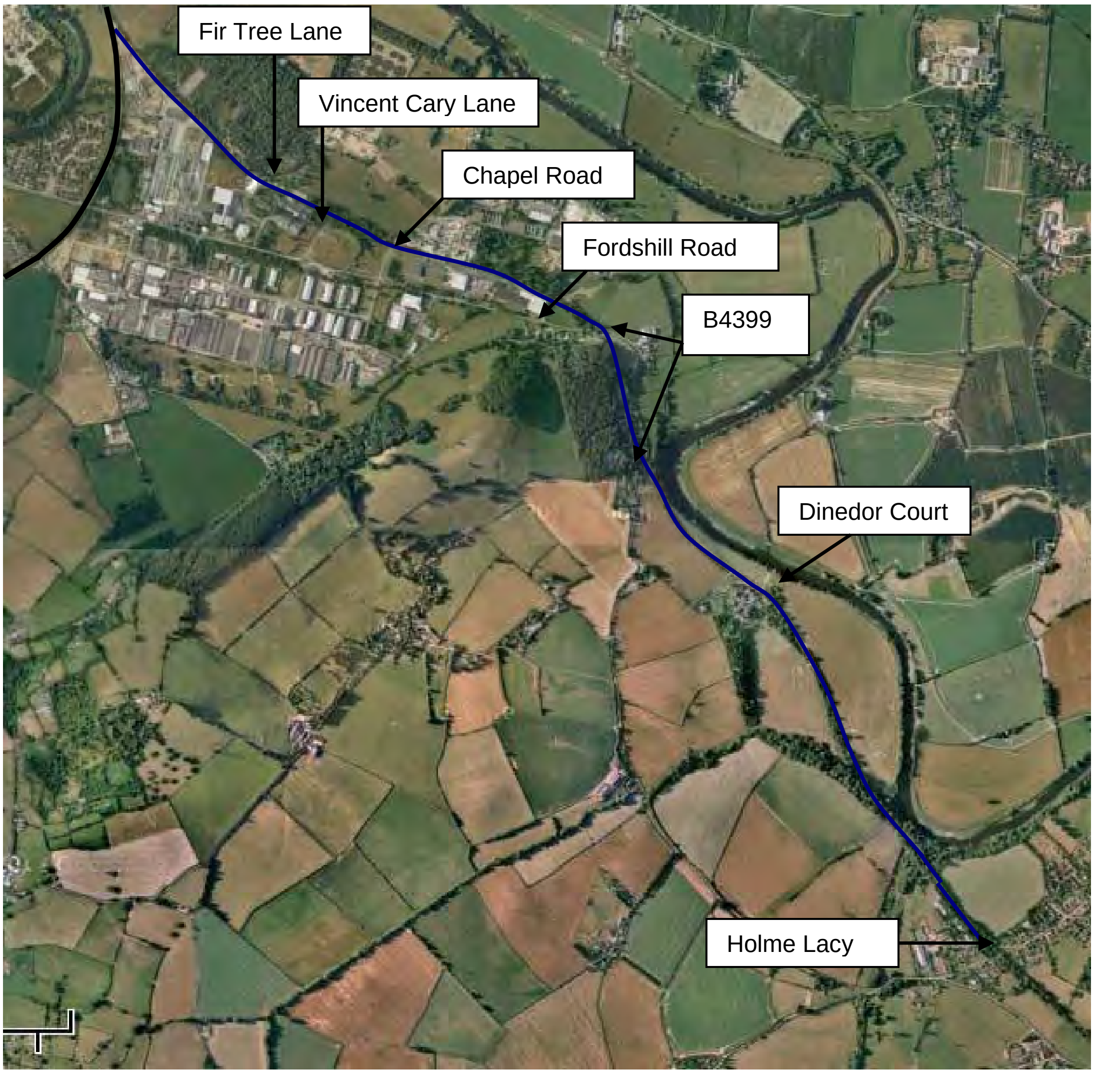

Figure 5 Abandoned Alignment and Key Locations

Figure 6 Abandoned Formation West of Fir Tree Lane

Figure 7 Alignment West of Vincent Cary Road (Potential Station Site)

Figure 8 Alignment West of Chapel Lane

Between Chapel Lane and Fordshill Road the alignment has been encroached for car parking and materials storage (see Figure 9). Recreation of the railway would have a potential impact on the operations of the adjacent businesses.

Figure 9 Alignment East of Chapel Lane

At Fordshill Road all traces of the former rail overbridge are missing and likely to have been at a restricted height. It will be necessary to raise the level of the embankment to provide a bridge acceptable for the observed HGV traffic using the highway. The existing embankment (Figure 10) is likely to be unstable.

Between Fordshill Road and the B4399 the alignment is identifiable but overgrown (See Figure 11). At the B4399 the bridge is missing, but the abutments remain (See Figure 12). The bridge is likely to be of restricted height but unlikely to be adjusted due to the proximity of the former tunnel.

Figures 10 & 11 Embankment at Fordshill Road and overgrown formation

Figure 12 Former bridge over B4399

Through Rotherwas Park Wood it was not possible to access the land to establish where the tunnel portals are and their condition. It is very likely that properties lie on or close to the alignment south of the B4399 and that gardens encroach the former rail formation. South of Rotherwas Park Wood the rail tunnel has been filled in and the tunnel portal is hidden / lost. There would be significant works required to reopen the tunnel.

Between the B4399 and Dinedor Court the abandoned alignment is difficult to observe within the field. At Dinedor Court the alignment is identifiable but used as access and new houses that have been built close to alignment (see Figure 13). There is also encroachment of the rail formation for vehicle storage and for storage of material and rubble / waste (Figure 14).

Between Dinedor Court and Holme Lacy the abandoned alignment is identifiable and not overgrown at the north end (see Figure 15), however it was not possible to access most of the alignment. Aerial photographs show the alignment as very wooded.

Figure 13 Abandoned formation at Dinedor Court

Figure 14 Storage of materials on Formation at Dinedor Court

Figure 15 Abandoned formation East of Dinedor Court

At Holme Lacy the alignment is identifiable and very overgrown (see Figure 16). The alignment and accesses are poorly drained. The alignment is filled in south of the bridge over the abandoned railway to provide a pedestrian footpath. There was no obvious sign of the former station. A new station would have to be positioned north of the road bridge. This is very overgrown and poor drainage prevented further observation of the formation.

Figure 16 Overgrown Rail Alignment at Holme Lacy

Land ownership information provided by Herefordshire Council revealed the former railway alignment to be in the ownership of Holme Lacy College at the southern end and approximately six other private individuals / businesses further north.

2.5 Rail Freight

Previous studies have been undertaken into the potential for a rail freight facility at Rotherwas. Those studies identified no local market for rail freight that could not be accommodated more efficiently at other locations. There is no identified new opportunity that would require a terminal at Rotherwas.

Rail freight use is growing considerably with most growth in intermodal traffic both to and from ports and the channel tunnel and domestic traffic. However, most commercial inland terminals are located in, or just outside, major urban areas where there is identifiable local market demand. For example; in the West Midlands the most successful terminals are the Freightliner terminal in Birmingham and the new terminals at Birch Coppice (near M42 / Motorway box) and Daventry (near M1 / M6 junction).

Hereford / Herefordshire lacks the strategic position and local demand for intermodal freight. Also, previous studies have also identified that the existing rail freight facility at Morton - on - Lugg can be developed to provide for other traffic. That would be more efficient than a facility off the main line at Rotherwas. This study did not therefore plan for a rail freight terminal at Rotherwas.

2.6 Capital Costs

The estimated capital costs for each option are shown in Tables 2-D and 2-E. These costs are indicative, based on estimated costs for similar schemes developed elsewhere and the background information available.

The costs include a nominal allowance for Transport and Works Order and land costs[3] to secure the rail alignment and a relatively high level of contingency considered appropriate for this stage of scheme development. An allowance has been included for parking at Leominster and Rotherwas stations to accommodate the expected demand.

Element	Cost £m
Leominster Turnback	£1.2m
Rotherwas Junction / Track	£1.7m
Signaling	£1.0m
Rotherwas Station	£1.5m
Land and TWA Costs	£0.8m
Leominster and Rotherwas Parking	£1.0m
Contingency (35%)	£2.5m
Design and PM (10%)	£1.0m
Total	£10.7m

Table 2-D Capital Costs Option 1: Leominster – Rotherwas (2010)

Leominster Turnback	£1.2m
Rotherwas Junction / Track	£1.7m
Signaling	£1.0m
Rotherwas Station	£1.5m
Leominster and Rotherwas Parking	£1.0m
Additional Track	£24.5m
Tunnel Reopening	£5.0m
Holme Lacy Station	£1.5m
Land and TWA Costs	£1.5m
Contingency (35%)	£13.6m
Design and PM (10%)	£5.3m
Total	£57.8m

Table 2-E Capital Costs Option 2: Leominster – Holme Lacy (2010)

The estimated cost for additional track between Rotherwas and Holme Lacy is based on a working assumption of £3.5m per km used for abandoned lines in the Sewta Rail Strategy Studies in South East Wales. The tunnel reopening costs are based on the Robin Hood Line inflated to 2010 prices.

The significantly higher costs of the extension to Holme Lacy reflect the additional distance and complexity of recreating the railway on that section as described.

[3] Land costs of £3k per sqkm for cleared industrial site based on Valuation Office Agency Property Market Report 2011.

3 Demand and Revenue Forecasts

3.1 Introduction

The demand and revenue forecasts for the scheme options have been based on industry standard models for the growth in demand between existing stations and the new rail demands generated by new stations.

3.2 Demand from Existing Stations

The new rail service would increase the frequency of service between Hereford and Leominster. The impact of this was assessed through application of the Rail Industry (MOIRA) forecasting model which is compliant with PDFH[4] and DfT Guidance. The advantage of this model is that the change in accessibility between all stations in the rail network is modelled and demand growth forecast through accepted elasticities.

The two timetable scenarios were added to the model and the forecast new rail demand and revenue is shown in Table 3-A. Although the model is forecasting the same increase in service between Hereford and Leominster (and other existing stations) there is an 11% difference in demand and 9% difference in revenue. This shows that the second timetable would be more effective – though, as noted, it would be more difficult to achieve.

Timetable Scenario	Demand	Revenue
Leominster - Rotherwas	46,470	£97,871
Leominster – Holme Lacy	51,569	£106,887

Table 3-A Demand and Revenue Growth – Existing Stations (MOIRA)

3.3 Demand for New Stations

The demand for new stations is more difficult to forecast due to the wide difference in the markets that are served. There is no single recommended approach in PDFH though Trip Rate models based on the existing catchment area and the demand at other similar, 'shadow', stations has been found to be most effective[5].

3.3.1 Existing Market

To assess the market for the new stations existing data and forecast land use changes has been assessed. Table 3-B shows the top flows for Hereford Station and Table 3-C shows the top revenues[6]. Whilst the top flows in terms of passenger numbers are between Hereford and Leominster and Ludlow, the higher revenues per journey for longer distance flows results in the top revenue flows being between Hereford and London, Birmingham and Cardiff.

[4] Rail Passenger Demand Forecasting Handbook
[5] New Rail Station Demand Forecasting Methodologies – A South Wales Case Study, G C Smith, European Transport Conference, October 2011
[6] For commercial reasons only percentages are shown.

Similarly, Tables 3-D and 3-E show the top journeys and revenues for Leominster Station. Hereford constitutes almost two thirds of trips from Leominster, by far the largest flow. Hereford and London flows make up approaching half of all revenues from this station. Rail travel (and particularly revenues) is therefore more important for longer distance trips.

Station	% Demand	Cumulative %
Leominster	15.8%	15.8%
Ludlow	10.0%	25.8%
London	8.3%	34.1%
Birmingham	8.0%	42.1%
Cardiff	4.7%	46.8%
Abergavenny	4.5%	51.3%
Manchester	1.9%	53.2%
Shrewsbury	1.6%	54.8%
Bristol Temple Meads	1.3%	56.1%
Newport	1.0%	57.2%
Craven Arms	1.0%	58.2%
Birmingham International	1.0%	59.2%
Cwmbran	0.7%	59.9%
Oxford	0.7%	60.5%
Liverpool	0.5%	61.0%
Church Stretton	0.4%	61.4%
Reading	0.4%	61.9%
Crewe	0.4%	62.3%

Table 3-B Top Flows for Hereford Station

Station	% Demand	Cumulative %
London	26.2%	26.2%
Birmingham	6.0%	32.2%
Cardiff	5.0%	37.1%
Leominster	3.9%	41.0%
Manchester	3.6%	44.6%
Ludlow	3.5%	48.1%
Abergavenny	2.1%	50.2%
Bristol Temple Meads	2.0%	52.2%
Shrewsbury	1.5%	53.7%
Newcastle	1.5%	55.2%
Reading	1.1%	56.3%
Birmingham International	1.1%	57.3%
Edinburgh	1.0%	58.4%
Oxford	1.0%	59.4%
Newport	1.0%	60.3%
Leeds	1.0%	61.3%
Liverpool	0.9%	62.2%
Glasgow	0.9%	63.1%
Sheffield	0.8%	63.9%

Table 3-C Top Revenues for Hereford Station

Station	% Demand	Cumulative %
Hereford	64.8%	64.8%
Ludlow	5.6%	70.3%
London	4.4%	74.7%
Cardiff	2.8%	77.5%
Manchester	2.7%	80.2%
Shrewsbury	2.4%	82.6%
Birmingham	1.4%	84.0%
Worcester	1.0%	85.0%

Table 3-D Top Flows for Leominster Station

Station	% Demand	Cumulative %
Hereford	22.1%	22.1%
London	21.3%	43.4%
Manchester	5.6%	49.0%
Cardiff	4.9%	53.9%
Shrewsbury	2.8%	56.7%
Ludlow	2.3%	58.9%
Birmingham	2.0%	61.0%
Bristol Temple Meads	1.8%	62.8%
Newcastle	1.3%	64.1%
Edinburgh	1.3%	65.4%
Liverpool	1.2%	66.5%
Newport	1.1%	67.7%
Glasgow	1.1%	68.8%
Worcester	1.0%	69.8%
Crewe	1.0%	70.8%

Table 3-E Top Revenues for Leominster Station

Table 3-F shows the results of analysis of the key traffic flows inside and outside Hereford based on the 2008 Saturn traffic model[7]. This shows that almost half of trips are relatively short and that of the remainder there are slightly more trips from outside Hereford coming into the city than leaving and a relatively low level of through trips. Rail is more effective at attracting longer distance trips.

Demand Segment	AM Peak (08:00 – 09:00)	PM Peak (17:00 – 18:00)
Trips within Hereford City	41%	45%
Trips from within Hereford to outside	21%	21%
Trips from outside Hereford to within	31%	26%
Through Trips	7%	8%

Table 3-F Key Hereford City Traffic Flows

[7] 2008 SATURN Base Model data supplied by Herefordshire Council.

3.3.2 Demand for trips to Rotherwas

The 2008 traffic model was also able to produce figures for traffic travelling between the City Centre (within half a mile of Hereford Station) and Rotherwas. Table 3-G shows that there are between 28 and 36 car trips within scope of the proposed rail service in the peak hours.

Demand Segment	AM Peak (08:00 – 09:00)	PM Peak (17:00 – 18:00)
To Rotherwas	28	8
From Rotherwas	8	20

Table 3-G Existing Traffic between Station Area and Rotherwas

Further observations of the existing travel demand and market for Rotherwas have been drawn from the Rotherwas Travel Plan[8]. This reported results from surveys of 84% of businesses in 2006 and travel surveys for 628 employees in 2008. The Herefordshire Business Directory (2009/10) states that 2,500 people are employed at 125 businesses at Rotherwas. The 2006 business survey reported that around 2% work on a shift pattern. Table 3-H shows that the predominant businesses are manufacturing and wholesale, retail and repairs.

Main Business Activity (SIC Sector)	%
Manufacturing	44%
Construction	6%
Wholesale, retail and repairs	30%
Catering and hotels	2%
Transport and communications	8%
Business Services	6%
Other Services	4%

Table 3-H Rotherwas Industrial Estate Employment Mix 2006

Figure 17 shows the origin location of employees. Almost half come from within Hereford and whilst others are spread over a wide area, a significant number come from Leominster – who would benefit from direct rail access. Figure 18 shows the origin locations of employees within Hereford City, revealing around 15 within walking distance of Hereford Station. The zone around Hereford Station are identified as containing the origins of 5.3% of employees – therefore around 133 trips.

Table 3-I shows the current mode share of trips made by Rotherwas Employees in 2008. As would be expected very few arrive by rail.

Travel Mode	Number	%
Walk	37	5%
Cycle	87	13%
Motorcycle	19	3%
Bus	14	2%
Rail	3	0%
Car Share	119	17%
Car Solo	403	59%
Total respondents	682	

[8] Rotherwas Travel Plan, Herefordshire Council / Rotherwas Futures, Amey, February 2010.

Table 3-I Existing Travel Modes – Rotherwas Employees

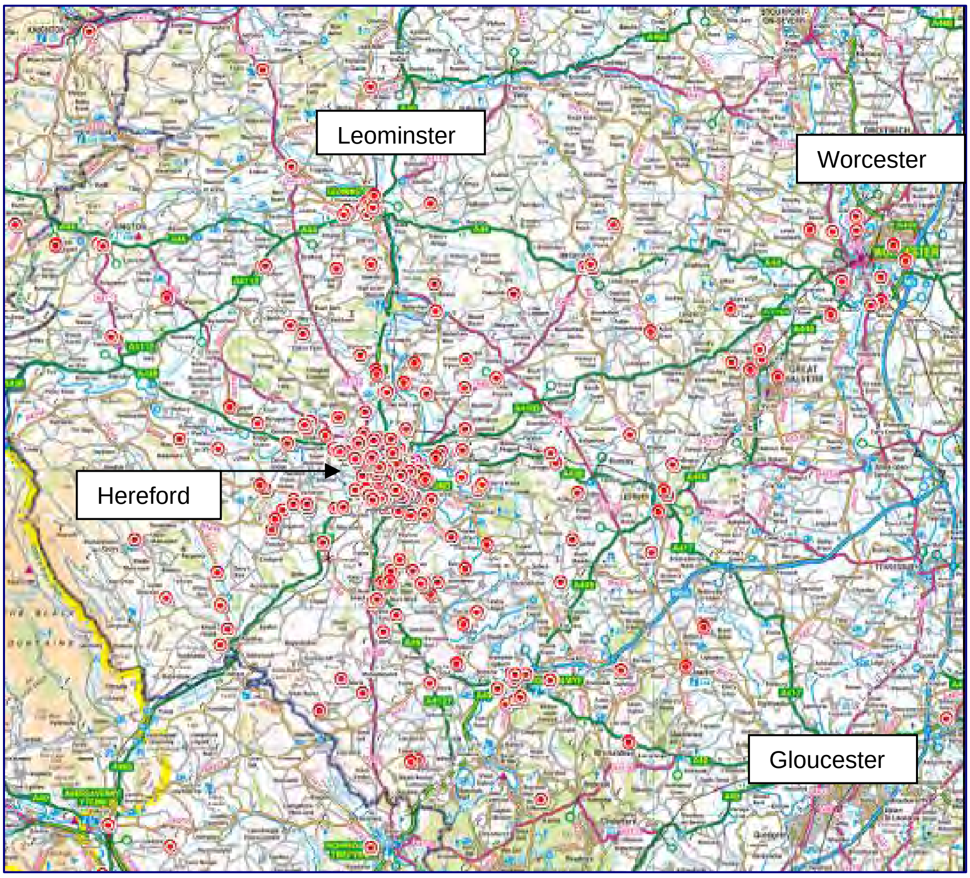

Figure 17 Origin Locations of Existing Rotherwas Employees (2008)

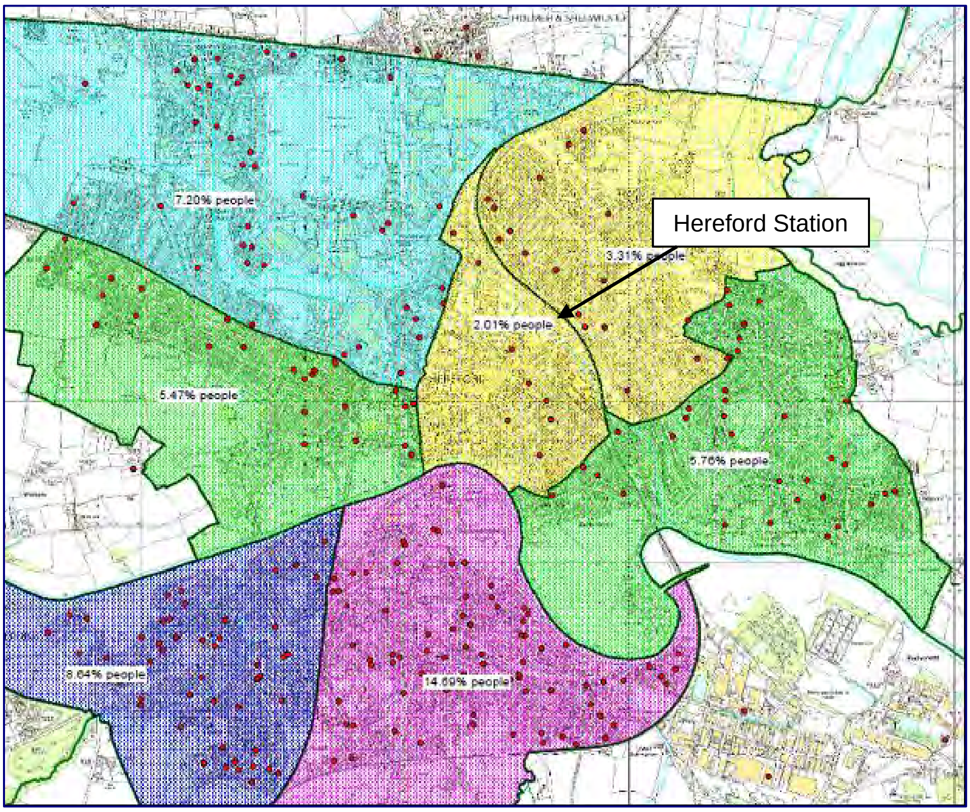

Figure 18 Origin Locations of Rotherwas Employees within Hereford (2008)

Table 3-J shows the mode shares for employees that could change their travel habits – confirming that around 2% could arrive by rail.

Travel Mode	Number who could change mode	%
Working at Home	21	8%
Walk	30	10%
Cycle	60	23%
Motorcycle	15	5%
Bus	5	2%
Rail	5	2%
Car Share	44	27%
Car Solo	60	24%
Number responding	265	
% of Sample	39%	

Table 3-J Mode Shares for Employees Who Could Change Travel Habits

In addition – Table 3-K shows the distances travelled between work and home in 2008 revealing a market of 23% who travel over 10 miles – where rail can provide a significant journey time advantage.

Distance Travelled	Number	%
Up to 1 Mile	45	7%
1 – 2 miles	127	18%
3 – 5 miles	232	34%
6 – 10 miles	124	18%
11 – 20 miles	88	13%
21 – 40 miles	51	7%
Over 40 miles	21	3%
Total	688	

Table 3-K Rotherwas Employees Travel Distances.

Rail trip rates for inbound trips to employment at stations tend to be relatively low. This is a related to the relatively small catchment area as the dominant egress mode at the destination station is walk[9] and passengers are resistant to walking much beyond 400m. Much of the existing Industrial Estate lies over 350m south of the proposed station. Studies recently undertaken in South Wales applied a rate of 1% for industrial developments and 5% for access to a National Museum site. Recent studies in London used a rail mode share of only 0.7% for retail warehousing.

Table 3-L shows the potential demand range for existing trips to Rotherwas station based on 1% and 2% mode shares, equating to 25 and 50 employees per day.

Existing Employees	Annual Demand at 1% Mode Share	Annual Demand at 2% Mode Share
2,500	15,550	31,100

Table 3-L Demand Range Existing Rotherwas Employees

[9] Whereas at the journey origin passengers have more choice to access the station by Walk, Cycle, Car (passenger) and Car (Driver), bus taxi and motorcycle.

The main appraisal uses the low, central, forecast and the higher figures tested as sensitivity tests within the appraisal.

Figure 19 shows the Rotherwas Estate Land Budget[10], highlighting the areas available for development and the location of the potential station.

Figure 19 Rotherwas Estate Land Budget

Whilst there is potential for significant additional employment in the Enterprise Zone (6,500 total employees, ie + 4,000 employees), several of the sites would be relatively remote from the station. In particular the ‘south magazine’ to the south of the existing Industrial Estate and at the northern end of Chapel Road would be beyond walking distance of the railway. The station could be positioned to serve the sites around Vincent Cary Road or the ‘north magazine’, the large development sites to the northwest.

It is assumed that the station could therefore directly serve approximately 50% of the new employment areas serving around 2,000 of the future potential employees. Table 3-M shows a demand range based on 2% and 5% mode shares based on the proportion of employees stating that they could arrive by train and the typical high mode shares for large scale businesses served by rail. These figures equate to between 40 and 100 employees per weekday. There is potential to encourage more rail access if the station development is integrated with the development.

Future (in scope) Employees	Annual Demand at 2% Mode Share	Annual Demand at 5% Mode Share
2,000	24,880	62,200

Table 3-M Demand Range Future Rotherwas Employees

[10] Received from the Project Manager of Rotherwas Futures, August 2012

3.3.3 Demand for Trips from Rotherwas and Holme Lacy

To assess the demand for trips to / from residential areas in the vicinity of the new stations a trip rate approach was used based on the PDFH recommendations. 2001 census data was analysed to provide evidence of the existing population in the vicinity of Hereford and Leominster stations and in the vicinity of the new stations. 800m and 2km catchments were defined, shown in Figure 20. In calculating the catchment population account has been taken of overlapping catchments as shown in the diagram.

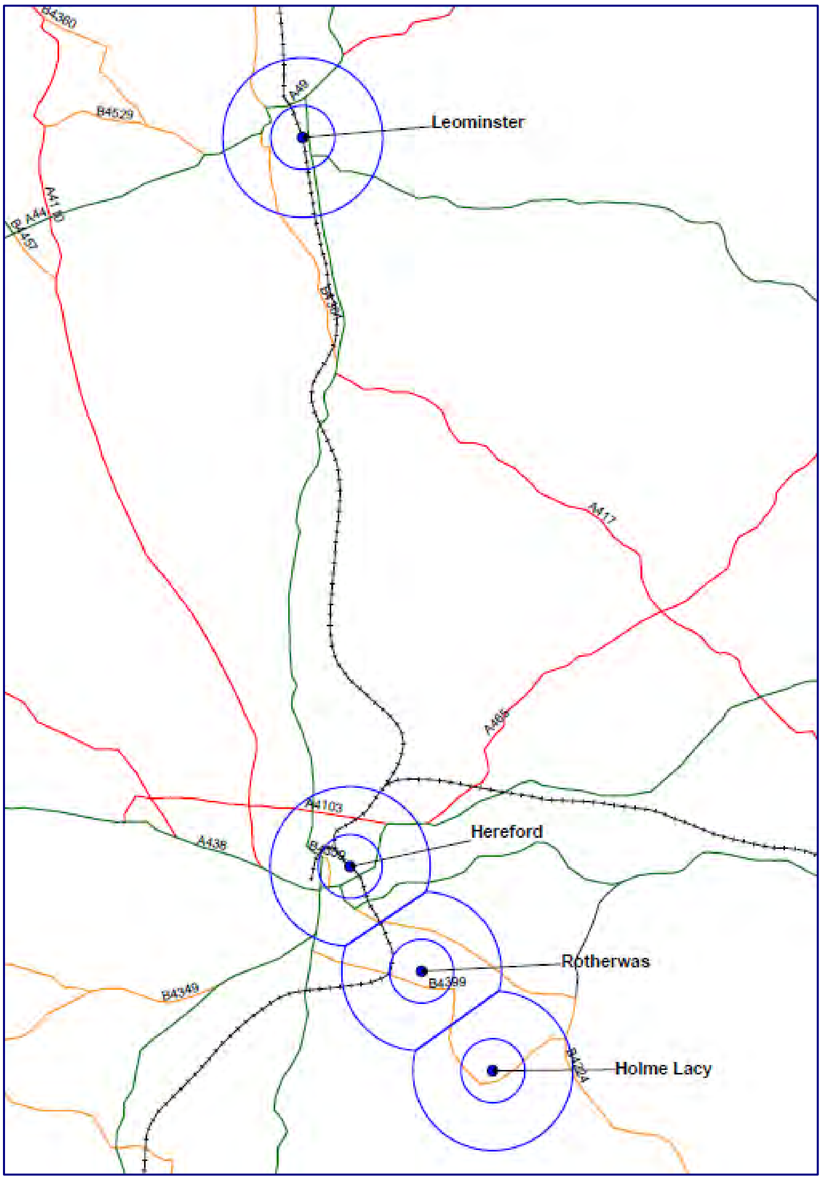

Figure 20 Station Catchment Analysis

Table 3-N shows the population data. It is noticeable that the population around Holme Lacy is very low compared to the other locations and also that the proportion of the population within the immediate vicinity (walk catchment) is also low for the new station sites.

Station	Population Within 800m	Population within 2km	Proportion of Population within 800m
Hereford	5,524	24,639	22%
Leominster	1,945	8,307	23%
Rotherwas	111	6,533	2%
Holme Lacy	71	449	16%

Table 3-N Catchment Population, Existing and New Stations

The latest PDFH manual specifies trip rates for 2004 for different socio economic groups. This was compared with the implied trip rates assuming the two kilometre catchments traditionally used for new station forecasting. The results are shown in Table 3-O and reveal a higher rate for Hereford than Leominster (which probably reflects the greater catchment area of Hereford) and rates within the range of the guidance.

Socio-Economic Group	Trips Per Person and Year 2004	2004 Observed Demand
Professional / Managerial	37	
Intermediate non-manual	34	
Junior non-manual	29	
Skilled Manual	13	
Other man. + Other	11	
Retired	5	
Other econ. Inactive	15	
Average	21	
Implied Trip Rates		
Hereford	30	732,320
Leominster	17	143,300

Table 3-O 2004 Rail Trip Rates (PDFH)

The majority of rail stations and demand are in the London area and the trip rates would be expected to be lower in Herefordshire. It was therefore concluded that Leominster could be used as an appropriate ‘shadow’ station for the demand forecasts at this stage. However, the recent demand growth results in an implied trip rate based on Leominster of 31 trips per person per year.

In application of the trip rates to the new stations it was considered appropriate to take account of the relative remoteness of the population. PDFH 2002 provided evidence of the trip rates within 800m and between 800m and 2km of stations based on research undertaken in West Yorkshire. Table 3-P shows that around 80% of demand is expected to come from the inner catchment.

Type of location	0-800m	800m – 2km	% of trip rate in outer area
Prime commuter belt	100	10	9%
Villages	25	6	19%
Built Up Areas	12	3	20%
Free Standing Town	10	3	23%

Table 3-P Trip Rate Variation (Daily trips / thousand population) (PDFH 2002)

Table 3-Q shows the demand forecasts for trips generated from the population in the vicinity of the new stations. These figures equate to approximately 69 people travelling from Rotherwas per weekday and 7 people travelling from Holme Lacy per weekday.

Station	Population	Trip Rate	Annual Demand
Rotherwas 0-800m	111	25	2,721
Rotherwas 800m – 2km	6422	6	40,038
Total Rotherwas			42,759
Holme Lacy 0-800m	71	25	1,741
Holme Lacy 800m-2km	378	6	2,752
Total Holme Lacy			4,492

Table 3-Q New Stations Trip Rate Demand Forecasts based on Population

As most of the trips are coming from beyond 800m of the stations, parking will therefore need to be provided at the stations to secure the demand - in the order of 50 spaces at Rotherwas.

The demand forecast for Rotherwas also needs to take into account the Strategic Housing site of 1,000 dwellings in Lower Bullingham which will be within the 800m – 2km catchment and therefore would be expected to generate 12,870 trips per year assuming an average household size of 2.1 persons.

Holme Lacy College is part of Herefordshire College of Technology (HCT). The Holme Lacy site is an agricultural college with a commercial farm, rural crafts centre and equestrian centre. HCT has 1,900 full time students (1,350 between ages 16 and 18) and 5,000 part time learners between the City and Holme Lacy campuses.

Available evidence does not suggest as substantial change in either the resident population of the village or the scale of education facilities at the college.

Given the low population figures for Holme Lacy site, it is not clear whether the students are included within the census data. A sensitivity test is included to assess the impact of a higher catchment population in the economic appraisal.

In addition, the trip forecast needed to be adjusted for the interchange required for many rail flows due to the stations being on the branch line. Leominster is directly connected to many other stations. Table 3-R shows the assumed initial breakdown of demand based on the information in Tables 3-B to 3-E and the calculation of the adjustment factor based on the Generalised Journey Time (GJT) from MOIRA and Standard Interchange Penalty (SIP) for the appropriate service frequency[11].

Table 3-S shows the resulting new station demand forecasts for each of the key flows and the revised breakdown for the Rotherwas and Holme Lacy central case and high demand forecasts. As a result of the reduction in longer distance flows the proportion assumed to travel between the new stations and Hereford and Leominster has risen to 67% and 16% respectively.

The overall impact of the interchange adjustment is between 3% and 4%.

[11] Based on PDFH guidance and using an elasticity of -0.9.

Flow	Initial %	Base GJT (mins)	SIP (mins)	New GJT (mins)	Demand Factor
Hereford	64%	Direct	-	-	1.0
Leominster	15%	Direct	-	-	1.0
Ludlow	5%	62	39	101	0.645
London	4%	245	47	292	0.854
Birmingham	4%	137	31	168	0.832
Cardiff	3%	101	39	140	0.745
Manchester	2%	178	39	217	0.867
Shrewsbury	2%	92	39	131	0.728
Abergavenny	1%	61	39	100	0.641

Table 3-R Demand Adjustment for Interchange

Flow	Rotherwas Central	Rotherwas High	Holme Lacy Central	Holme Lacy High	%
Hereford	61,478	95,315	64,353	98,190	67%
Leominster	14,409	22,339	15,083	23,013	16%
Ludlow	3,096	4,800	3,241	4,944	3%
London	3,281	5,087	3,434	5,240	4%
Birmingham	3,198	4,958	3,347	5,108	4%
Cardiff	2,148	3,330	2,248	3,431	2%
Manchester	1,607	2,492	1,683	2,567	2%
Shrewsbury	1,398	2,167	1,463	2,232	2%
Abergavenny	616	955	644	983	1%
Total	91,230	141,442	95,497	145,709	

Table 3-S New Station Demand Forecasts with Interchange Reduction

3.3.4 Abstraction from Hereford Station

The appraisal of the options also needs to take account of the potential abstraction from Hereford Station. Rotherwas Station would serve part of south east Hereford that lies partly with and outside the 2km catchment of Hereford. To provide an estimate of the abstraction a nominal trip rate of 4 trips per person per year was used. This would equate to 8,127 trips per annum and was taken from the total generated demand / revenue lines within the economic appraisal.

3.3.5 Park and Ride

The station sites could be used for strategic park and ride into Hereford, especially Rotherwas situated at the north end of the new access road from the A49. However, the demand for park and ride is considered small due to the relatively lower service frequency (half hourly) and relatively remote location of Hereford Station to the city centre. There would also be significant potential that promotion of park and ride would lead to an abstraction of further Hereford Station demand and parking revenues.

Park and ride has not therefore been included in the demand forecasts.

3.3.6 Summary of Demand Forecasts

Table 3-T brings together the demand forecasts for each Scenario.

	Rotherwas Central	Rotherwas High	Holme Lacy Central	Holme Lacy High
Existing Stations	46,470	46,470	51,569	51,569
New Stations	91,230	141,442	95,497	145,709
Total	137,700	187,912	147,066	197,278

Table 3-T Summary Demand Forecasts

The Rotherwas Scenario Central demand forecasts equate to between 443 and 604 passenger journeys per weekday. If evenly spread between trains between 0700 and 1900 this suggests between 18 and 25 passengers per train. In practice demand is likely to be peaked, so off peak loads may be very low and would not justify a half-hourly service.

3.4 Revenue Forecasts

The revenue forecasts have been based on the outputs from the MOIRA model in terms of the forecast revenues for new demands between existing stations and the application of the average revenue rate for each key flow for the new stations.

	Rotherwas Central	Rotherwas High	Holme Lacy Central	Holme Lacy High
Existing Stations	£98,052	£98,052	£108,811	£108,811
New Stations	£334,454	£518,535	£350,095	£534,176
Total	£432,506	£616,587	£458,906	£642,987

Table 3-U Revenue Forecasts New Stations

3.5 Demand and Revenue Growth

Figure 21 shows the published passenger footfall data for the period 2004/05 - 2010/11 for Hereford Station. There has been almost consistent growth in passengers from 0.73m to 1.02m passengers per annum, with an average growth of 6.5% per annum.

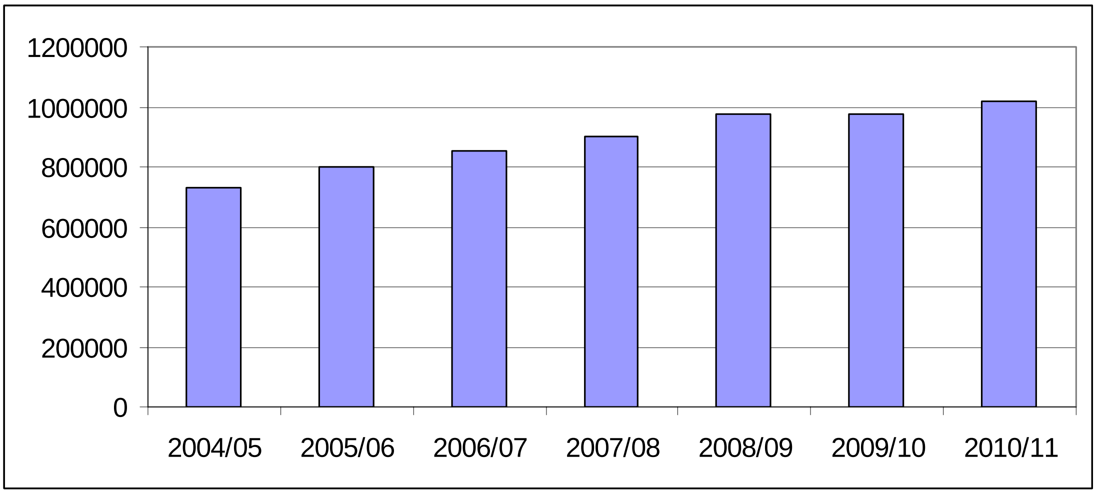

Figure 21 Hereford Station Passenger Footfall 2004/05 – 2010/11

Figure 22 shows the passenger footfall data for Leominster Station where demand has grown from below 150k to above 250k per annum. Growth has fluctuated more than for Hereford, but the average over the period is 12.7% per annum.

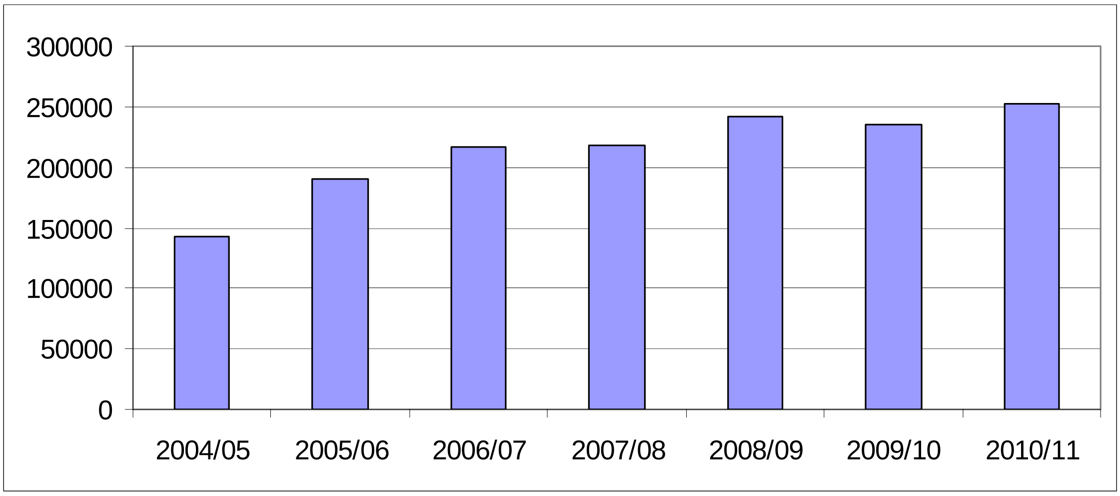

Figure 22 Leominster Station Passenger Footfall 2004/05 – 2010/11

The Route Utilisation Strategy for Wales (Wales RUS) was published by Network Rail in November 2008 and contains passenger growth forecasts for the Marches Line local trips of around 15% between 2006/07 and 2018/19, significantly lower than longer distance trips at around 22%. This equates to around 1.4% per annum which is significantly lower than the observed growth for Leominster and Hereford stations.

However, much of the growth in Figures 20 and 21 was between 2004/05 and 2006/07. The growth between 2006/07 and 2010/11 was 19% (4.8% per annum) for Hereford and 16% (4.1% per annum) for Leominster. This suggests that the RUS forecasts were overly cautious. Table 3-V shows the forecasts assumed for the economic appraisal based on a continuation of observed local growth declining to the RUS forecasts in the longer term[12].

Years	Growth per Annum
Prior to 2011/12	4.4%
2012/13	4.0%
2013/14	3.5%
2014/15	3.0%
2015/16	2.5%
2016/17	2.0%
2017/18	1.8%
2018/19	1.5%
2019/20 – 2024/25	1.4%
2025/26 onwards[13]	1.4%

Table 3-V Demand Growth Assumptions

[12] Note that long term rail demand growth is capped in 2032 within the appraisal in line with DfT guidance.
[13] Note that long term rail demand growth is capped in 2032 within the appraisal in line with DfT guidance.

4 Scheme Appraisal

4.1 Introduction

The appraisal of the scheme options has been based on the economic appraisal – the primary determinant of value for money. The economic appraisal brings together costs and benefits including demand and revenue forecasts and user and non-user benefits. Specifically;

- *User Time Savings – for existing and new rail passengers;*
- *Rail Safety Benefits (costs) - resulting from the increased use of rail,*
- *External – non-user benefits relating to;*
    1. *Traffic decongestion time saving benefits – as a result of the additional rail traffic resulting from the scheme some of which will have transferred from making journeys by private car;*
    2. *Infrastructure maintenance cost savings as a result of the reduction of traffic on the highway network;*
    3. *Accident Savings – resulting from a reduction in trips on the highway as a result of the mode shift to rail, and;*
    4. *Environment benefits attributed to improved local air quality and reduced greenhouse gases relating to the mode switch to rail.*

Throughout this section of the report the tables present detailed figures for the Leominster – Rotherwas option and the summary results are given for the Leominster – Holme Lacy option.

4.2 User Benefits

The User time savings estimates were based on the MOIRA model results and assumptions relating to the user time savings for new stations.

For new station users an average time saving of 5 minutes per journey was assumed. Whilst the rail journey times are 5 minutes between Hereford and Rotherwas compared to a car journey time of 12 minutes and 23 minutes between Leominster and Rotherwas compared to a car journey time of 33 minutes account needs to be taken of station access and egress times which will vary depending on the actual distance to the stations at each end.

An average value or time was calculated for application to the time savings based on appraisal guidance[14]. The values of work (business), commuting and other trips times were weighted by the proportions for average rail passengers (7.6% work, 52.2% commute and 40.3% other), leading to a value of time of £9.26 per hour in 2010 prices.

[14] WebTAG Unit 3.5.6 Values of Time and Vehicle Operating Costs, May 2012 (in Draft), DfT

Table 4-A shows the user time savings for existing station users and new station passengers.

Market Segment	Rotherwas Central	Rotherwas High	Holme Lacy Central	Holme Lacy High
Existing Station Users (MOIRA)	£272,404	£272,404	£272,404	£272,404
New Station Users	£70,391	£109,134	£73,683	£112,426
Total	**£342,795**	**£381,538**	**£346,087**	**£384,830**

Table 4-A   User Time Savings (2010 prices and values)

4.3 External Benefits

The non-user benefits have been assessed using the DfT Guidance on Rail Appraisal: External Costs of Car Use in Rail Appraisal[15] which produced recommended values for congestion, infrastructure, accident, local air quality and greenhouse gases benefits resulting from the assumed transfer of trips from car for 2010 and 2035.

The appraisal assumes car transfers of 44% of new rail demand (in line with WebTAG guidance and evidence from the National Transport Model) and a car occupancy factor of 1.2 to derive the net change in car kms. The forecast of new rail miles was based on the key demand segments using the MOIRA miles plus assumed 50% local and 50% longer distance miles for new station users.

The rates used and values derived for the external impacts are shown in Table 4-B.

Marginal External Cost	Rate p/pass car unit 2010	Rate p/pass car unit 2035	Value 2010	Value 2035
Congestion (weighted average)	13.44	32.46	£165,330	£598,169
Infrastructure	0.10	0.20	£1,230	£3,686
Accident	3.00	4.60	£36,902	£84,767
Local Air Quality	0.10	0.00	£1,230	£0
Noise	0.20	0.30	£2,460	£5,528
Greenhouse gases	0.80	0.90	£9,840	£16,585

Table 4-B   External Costs of Car Use (Non-user benefits) rates / values (2010 prices).

Table 4-C shows the calculated annual reduction in pollutant emissions resulting from the reduction in car use forecast as a result of the expected mode switch to rail as a result of the scheme in 2010.

Pollutant	Tonnes Reduced p.a.
Carbon Monoxide	8.69
Nitrogen Dioxide	1.88
Non Methane Hydrocarbons	1.25
Particulates	0.08
Carbon Dioxide	302.40

Table 4-C   Estimated Reduced Pollutant Emissions (Tonnes Per Annum) (2010)

[15] WebTAG unit 3.13.2, External Costs of Car Use in Rail Appraisal, May 2012, DfT, and associated spreadsheets.

The important pollutants in local air quality impact assessment are Nitrogen Dioxide and Particulates. The important pollutants for the assessment of greenhouse gas impacts are Carbon Dioxide emissions.

4.4 Health Benefits

New regular users of public transport may experience health benefits through increased walking to and from the train stations at each end of the journey, around 30 minutes each day.

The quantification of this impact is based on the DfT guidance on the Appraisal of Walking and Cycling Schemes, which notes that the methodology is likely to underestimate impacts, though this can be covered by assessment of reduced absenteeism (see below). The health benefit is based on an assessment of preventable deaths per year and application of the value of a life, grown in time with GDP growth. Table 4-D shows the calculation of the expected reduced mortality benefit.

Element	Value
Additional walk / cycle trips per annum	137,700
Total trips per day	221
Assumed Frequent / regular users (52.2%)	116
Mean proportion of England and Wales population aged 15 -64 who die each year from all causes (source. ONS, 2007)	0.00235
Expected deaths in population per year	0.27157
Application of displacement factor (50%)	0.1358
Cost of Life (source: DfT, 2010 cost at 2010 prices)	£1.882m
Reduced mortality benefits per annum	**£255,607**

Table 4-D Benefits of Increased Physical Activity (Mortality Benefits) (2010 Prices)

Estimation of reduced absenteeism benefits is based on DfT Guidance on the Appraisal of Walking and Cycling Schemes. This assumes that for each employee who takes up physical exercise for 30 minutes a day for 5 days a week annual benefit to employers is likely to be (on average) as least 0.4 days gross salary costs.

The gross salary cost in DfT guidance[16] is £34.12 per hour in 2010 prices and values. Table 4-E shows the calculation of the estimated employees receiving the benefit and the application of the factor to derive the employers' benefits.

Element	Value
.New regular walk trips, journeys p.a.	35,940
Person Trips per year	17,970
Persons / day (assuming 250 working days)	72
Assumed Hours benefit (0.4 * 8)	3.2
Value per employee (3.2 * £34.12)	£109.18
Reduced Absenteeism benefits per annum	**£7,848**

Table 4-E Estimation of Reduced Absenteeism Benefits

[16] Webtag Unit 3.5.6, Values of Time and Operating Costs, May 2012

4.5 Rail Safety Benefits (Costs)

The economic appraisal takes account of the saving in road accidents as a result of reduced highway traffic and the increase in rail accidents as a result of increased rail use. Table 4-F shows the calculations utilising the rates and values in published appraisal guidance[17] for the scheme:

Element	Value
Cost per rail fatality (2010 prices)	£1,653,687
Cost per serious rail injury (2010 Prices)	£165,369
Casualty Rate (Fatalities) Accidents per Pass Km	0.0000000005
Casualty Rate (Serious Injury) Accidents per Pass Km	0.000000018
2010 New Rail Passenger kms	1,230,053
2010 Rail Safety Impacts (2010 prices) per annum	£12,760

Table 4-F Rail Safety Benefits (costs) (2010, 2010 prices)

4.6 Indirect Tax Cost to Government

The transfer of journeys from the private car to rail results in a loss of government revenue as a result of the reduction in fuel sales and the resulting reduction in fuel tax income. For this appraisal the value of this factor was estimated using the DfT Guidance on Rail Appraisal: External Costs of Car Use (Transport Analysis Guidance Unit 3.13.2, May 2012) spreadsheets. The values are 4.8p / car km in 2010 and 3.3p / car km in 2035 (which incorporates the DfT's assumption that vehicles become more fuel efficient over time).

While the use of this spreadsheet value in this context does not strictly follow Transport Appraisal Guidance, this represents a suitable simplified approach for this scheme. Application of these factors to the reduced car miles results in estimated costs of £59k in 2010 rising £61k in 2035; the rise being due to the demand growth assumption.

4.7 Economic Appraisal Assumptions

The economic appraisal has been undertaken in accordance with the Guidance on Rail Appraisal though some simplifications were made in relation to the assessment of taxation implications. Key assumptions were;

- *First year of operation 2015/16, assuming 3 years of scheme planning / development, TWA, design and construction. The impact of delaying construction and operation to 2020 is examined as a sensitivity test;*
- *Capital costs spread between 2012, 2013, 2014 and 2015 = 10%, 30%, 55%, 5%;*
- *2010 price base and 2010 prices;*
- *Capital costs are subject to 66% uplift for optimism bias factor. This factor is large and the impact is tested as a sensitivity test;*

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[17] Rail accident rates from the Rail Closures Guidance 2006 and values of fatal and serious accidents from WebTAG 3.4.1 The Accidents Sub-objective (May 2012), DfT.

- *Operating costs are subject to 41% uplift for optimism bias factor, in accordance with a level 1 scheme as defined in rail appraisal guidance. As a calibrated operating cost model suitable for higher level appraisals has been used, the impact of this factor is tested as a sensitivity test;*

- *Discounted over 60 years of operation from 2015 to a 2010 base assuming a discount rate of 3.5% to 2043 and 3.0% for the remaining years;*

- *Assuming value of time growth in accordance with latest appraisal guidance18;*

- *Interpolation of the growth in external costs of car use (non-user benefits) between the forecasts for 2010 and 2035 with only rail passenger and value of time growth thereafter;*

- *Demand and revenue growth is capped in line with Rail Appraisal Guidance; 20 years from the scheme appraisal year (2032). This impact of this is tested as a sensitivity test;*

- *Application of the 19% market price adjustment factor to the Capital Costs, Operating Costs and Revenues, and to User Benefits, and;*

- *The appraisal takes account of the planned growth in rail fares of RPI +1%; operating costs are also assumed to increase by RPI +1%. A revenue elasticity of 0.4 is applied to the fares increase to determine revenue growth.*

4.8 Cost Benefit Analysis Results

The value for money assessment based on the benefit – cost ratio (BCR) as specified in the Guidance on Rail Appraisal is summarised in Table 4-G.

The BCR is the Present Value of the Benefits (PVB) divided by the Present Value of the Costs (PVC) where;

- *PVB = private revenues – private costs + subsidies + grants + user benefits + non user benefits and;*
- *PVC = cost to government*

Element	Option 1 Leominster – Rotherwas	Option 2 Leominster – Holme Lacy
Present Value Benefits (PVB)	£50.0m	£53.3m
Present Value Costs (PVC)	£69.3m	£151.8m
Net Present Value (NPV)	-£19.3m	-£98.5m
Benefit Cost Ratio (BCR)	**0.7**	**0.4**

Table 4-G Economic Appraisal (Present Values)

The Tables summarising the economic efficiency, public accounts and analysis of monetised costs and benefits are provided in Appendix B. Within the tables user benefits and non-user decongestion benefits are split between journey purposes based on the passenger survey weighted between weekdays and weekend days. The breakdown assumed was; Business = 5.48%; Commuting = 50.17%, and; other trips = 44.35%.

[18] WebTAG Unit 3.5.6, Values of Time and Vehicle Operating Costs, May 2012, DfT.

4.9 Subsidy Implications

The economic appraisal revealed a significant subsidy requirement (PV £51.3m for Option 1).

Table 4-H shows the annual subsidy and subsidy per passenger for the first 5 years including operating cost optimism bias. The subsidy falls by £45k over 5 years but the appraisal model reveals an ongoing subsidy requirement throughout the 60 year appraisal period.

Year	Subsidy £k	Subsidy per new rail passenger £
2015	£2,579	£15.78
2016	£2,566	£15.40
2017	£2,554	£15.06
2018	£2,544	£14.77
2019	£2,534	£14.51

Table 4-H Subsidy Requirements Leominster – Rotherwas (including Optimism Bias)

The high subsidy is based on the high optimism bias on operating costs included in the appraisal. Table 4-I presents a breakdown of the subsidy for 2015 with and without the operating cost optimism bias. Table 4-J shows the build-up of the 2015 revenue figure from the base year demand forecasts. Removing this reduces the initial subsidy to £1.7m per annum and subsidy per passenger to £10.31.

	Without Optimism Bias	With Optimism Bias
Revenue Existing Stations	£118,668	£118,668
Revenue New Stations	£404,776	£404,776
Abstraction from Hereford	-£25,526	-£25,526
Net Revenue	£497,918	£497,918
Operating Costs	£2,182,000	£3,076,620
Subsidy	£1,684,082	£2,578,702
New Passengers	163,369	163,369
Subsidy per Passenger	£10.31	£15.78

Table 4-I Breakdown of Subsidy Figures 2015

Year	2010[19]	2011	2012	2013	2014	2015
Growth Rate		1.044	1.040	1.035	1.030	1.025
Existing Stations	£98,052[20]	£102,774	£107,311	£111,510	£115,314	£118,668
New Stations	£334,454	£350,563	£366,040	£380,362	£393,335	£404,776

Table 4-J Growth in Revenue from 2010 to 2015

[19] As reported in Table 3-T
[20] Slightly higher than MOIRA output due to rounding using average rate to nearest £0.01

This level of subsidy is a potential showstopper as it could make the rail service unaffordable.

In addition the high capital cost and higher operating costs of operation through to Holme Lacy are not matched by increased demand, revenue and benefits, resulting in both a high operations subsidy and negative economic case.

4.10 Sensitivity Analysis

A number of sensitivity tests were undertaken to establish the sensitivity of the BCR to scheme assumptions and economic appraisal assumptions;

- Removal of Optimism Bias Operating Costs
- Removal of Optimism Bias on Operating Costs and Capital Costs
- Removal of Optimism Bias and Growth not constrained at 2035
- Removal of Optimism Bias High Demand Scenario
- Removal of Optimism Bias 20% lower Capital Costs
- Higher Holme Lacy Population
- Delayed construction and operation

These are summarised in Table 4-K and show that the benefit cost ratio is sensitive to the changes modelled, in particular the optimism bias factors and revenue factors.

Sensitivity Test	BCR Option 1	BCR Option 2
Base BCR	0.7	0.4
Removal of Operating Cost Bias	1.0	0.4
Removal of Operating and Capital Cost Bias	1.2	0.6
High Demand Scenario	1.0	0.5
Removal of optimism bias and unconstrained growth	1.5	0.7
Removal of OB and High Demand Scenario	1.8	0.8
Removal of OB and 20% lower capital costs	1.2	0.7
Additional 2,000 population in Holme Lacy		0.5
Delayed Construction and Operation to 2020	0.8	

Table 4-K Sensitivity Analysis Results

There is justification for the removal of the operating cost optimism bias as the calibrated model used would satisfy later stages of the scheme development. However there is less justification for removing the capital cost optimism bias.

For securing funding support the DfT schemes require a BCR above 2.0, though some schemes with BCR between 1.5 and 2.0 would be supported if they have significant wider economic benefits. The BCR range of the Leominster to Rotherwas scheme is between 0.7 and 1.8. Even though the scheme would enhance access to jobs at the Rotherwas Industrial Estate it is unlikely to secure Government funding support.

The results show that the extension to Holme Lacy is very unlikely to have a positive business case. The incremental benefits do not outweigh the additional costs and that scheme is therefore very unlikely to secure funding.

5 Conclusions and Recommendations

This study has shown that it would be practical to re-create a rail line from the junction with the main line at Rotherwas to a new station to serve the expanding Industrial Estate. The study has also shown that it might be possible to implement a half hourly service between Leominster and Rotherwas, though there would be a number of conflicts to resolve in detailed timetable planning.

The study has revealed that it would be significantly more difficult and costly to extend the rail line to Holme Lacy and that the timetable for a half hourly service would be extremely difficult to achieve. The economic appraisal revealed that the incremental benefits do not justify the additional costs and it is therefore not recommended to pursue the Holme Lacy option.

The economic appraisal of the Rotherwas option revealed a relatively weak economic case, with a Benefit Cost Ratio in the range of 0.7 to 1.8. The scheme is unlikely to secure funding support even if it could be argues that there were identifiable wider economic benefits through improve rail access to jobs a the Industrial Estate.

The scheme appraisal also revealed a significant annual revenue subsidy requirement. This is unlikely to be affordable to either to the Local Authority or central Government and therefore is likely to be a major hurdle for the Rotherwas Option.

Further hurdles are likely to be land ownership and acquisition of the alignment between the Main Line and Rotherwas Station site at Vincent Cary Road, and the acceptability of closing Fir Tree Lane.

The appraisal of the scheme has concentrated on the economic, value for money case for the scheme. In determining whether to take the scheme forward there is a need to undertake a full appraisal in accordance with DfT WebTAG guidance including environmental assessment. However, for the Rotherwas option there are likely to be few major environmental hurdles, but there are more significant issues associated with the Holme Lacy option.

In addition, the study has not examined in detail the impact of the proposal on other projects and aspirations. It is, however, noted that the rail alignment also features in Herefordshire Councils plans to improve cycle access to and through Rotherwas. There would be a need for detailed design of the alignment to establish how both the rail and cycle corridor could be created in parallel. A key issue would be whether there is a need to create a passing loop / double track on the Rotherwas branch. However, the cycle route is proposed to diverge to the south when it reaches the main line, whereas the rail line would need to diverge to the north. It is therefore considered possible that the cycle route could be provided to the south of the reinstated rail line. The cycle track would also improve accessibility to a station at Rotherwas.

The project has a capital cost over £5m and is therefore classed as a 'major scheme'. Applications for DfT funding for major schemes have to be accompanied by a business case including commercial assessment. That would require the operating costs to be covered by forecast revenues or by a third party for at least 3 years, at which point the DfT might then incorporate the service within the rail franchise. However, they are unlikely to accept a large subsidy. The last round was for schemes for delivery by 2014, future major scheme funding is being revised and may be through allocations to Local Enterprise Partnerships (LEP's). Hereford is within The Marches LEP which also covers Shropshire and Telford and Wrekin. The mechanism and budgets have yet to be specified but there is likely to be a need for the LEP to prioritise schemes for investment and they are likely to favour schemes which contribute greatly to economic recovery and jobs growth. This would need to be assessed in more detail, but in any case the affordability of the scheme would remain an issue.

An alternative would be to secure the scheme as a 'costed option' within the re-franchising of the rail services. The services through Hereford fall under three franchises;

- *Great Western Franchise - current being re-franchised;*
- *Wales and Borders franchise - due for renewal in 2018. The Welsh Government is highly unlikely to underwrite the costs of the scheme; and,*
- *London Midland Franchise - due for renewal in 2015.*

However, the affordability issue will continue to have a bearing on project acceptability. The franchise is however a route to secure additional funding through the private sector (eg: for new trains).

As mentioned above, third party funding could be useful within the funding package. This could take the form of capital investment in the infrastructure and / or revenue support for services, usually for a specified number of years. Herefordshire Council would, however, face a major risk of not being able to support the service in the long term. All local authorities are revenue constrained so this risk is extremely important to the Council.

As the rail station / service meets the transport needs of the businesses at Rotherwas a business improvement district could be established – perhaps as vehicle for a levy to raise the necessary funds to support the service. This could be discussed further with Rotherwas Futures.

Although Network Rail raised the issue that there is a window of opportunity presented through the ongoing Hereford Station Area resignalling works, which could provide an opportunity to integrate the signalling costs and reduce the scheme costs. The relatively poor business case for the scheme is unlikely to be impacted greatly by the reduction of capital costs. Also, Network Rail suggested an alternative option based on extending the existing Birmingham – Hereford service to Rotherwas and reducing the Leominster service to hourly. However, it is known that the resignalling works are seeking to reduce the turn-round time of the Birmingham service to better utilise the existing resources elsewhere.

In conclusion, this high level business case study has revealed a relatively poor business case for the scheme to provide rail access to Rotherwas and a substantial practical issue related to subsidy requirements which make the scheme unaffordable. This issue is a barrier to most funding avenues for the scheme.

Appendix A Key Sections of Atkins Infrastructure Report, 2000

The Atkins Herefordshire Rail Study, Infrastructure Improvements Report, January 2000 contained an assessment of the infrastructure required for a rail freight terminal at Rotherwas. Key elements of the report are;

“The site at Rotherwas has in the past had a rail connection when it was a Royal Ordnance factory. This connection came off the former Ross-on-Wye line, which itself diverged from the current main line just south of the River Wye crossing, at Rotherwas Junction. However, since closure of this line part of the rail embankment immediately south of the site of Rotherwas Junction has been removed.”

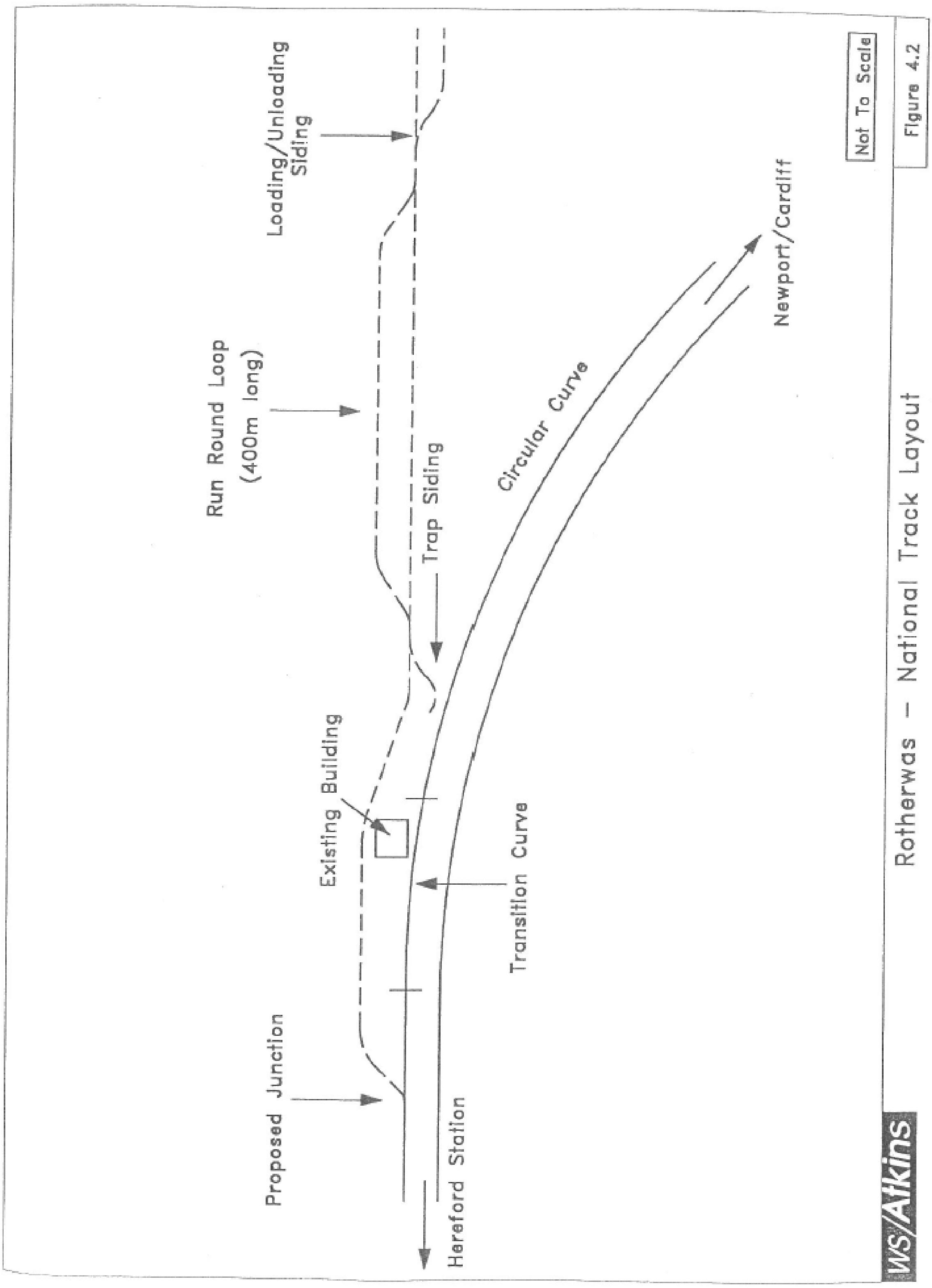
The study recommended a connection to the main line to the North, noting that the current track alignment is likely to require a turnout (point) for serving the siding to be located north of the existing curve. A short section of embankment / retaining wall with heights of about 2 – 4 m would be likely to be required, with associated engineering difficulties and costs. Provision of signalling to access the site at Rotherwas is likely to incur considerable costs.

It was noted that “no existing rail facilities are in place…” and the report identified the arrangements for a freight facility: “The layout of the site and the existing terrain appears to favour a facing connection from the down (southbound) track; a notional track layout is indicated in the Figure (overleaf)…. The location of the railway junction for the site would be approximately where the Rotherwas junction used to be.”

The report noted that “there seems to be a transition curve at the site where the old junction used to be.” It is likely that the cant (elevation of the track around curves) was increased to enable higher speed operation on the main line. The connection to the north of the previous junction requires a retained embankment on its east side over a length of at least 100m (possibly up to 250m) (Shown in the second attached figure).

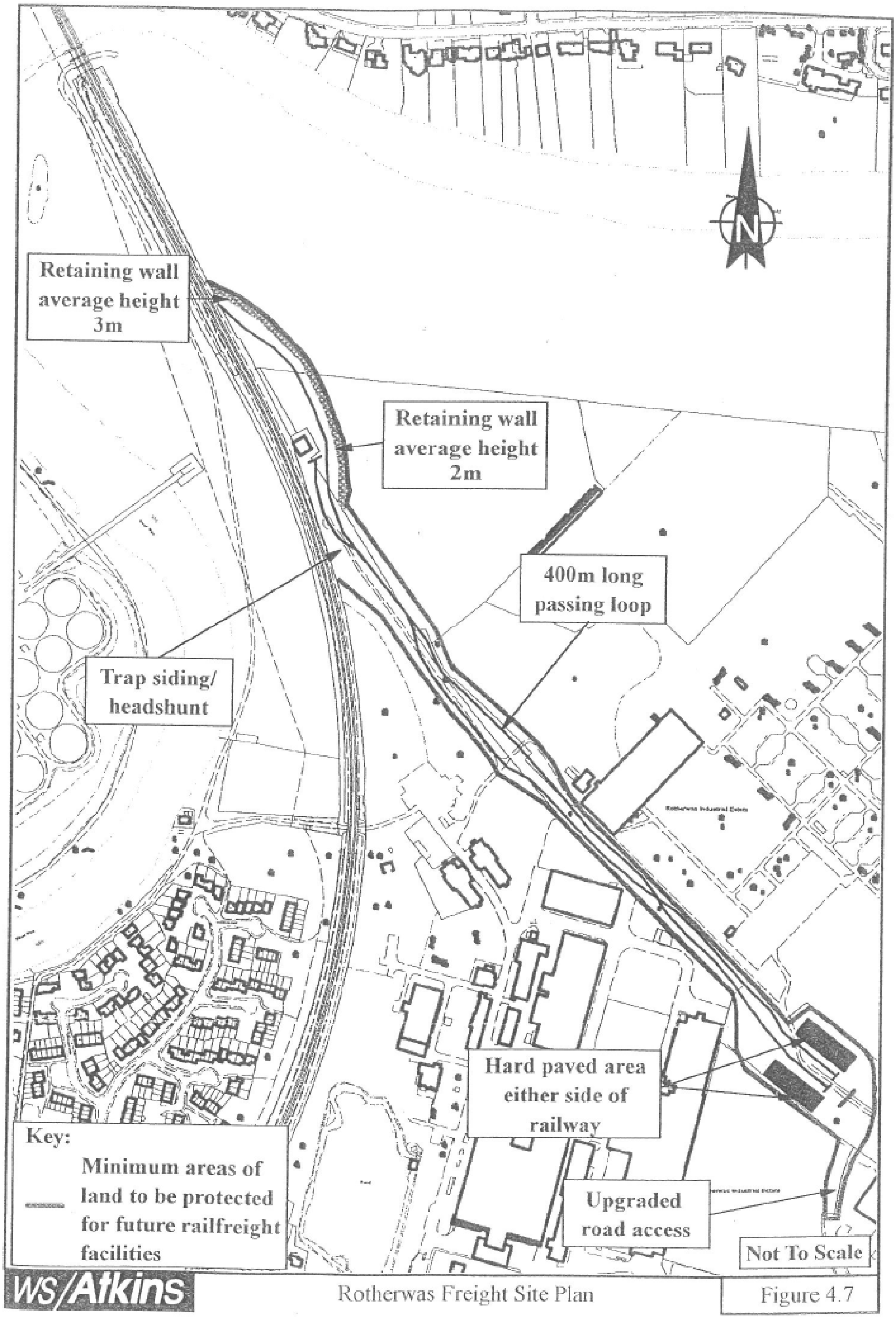
Costs associated with the rail freight terminal were for formation preparation, track, signalling and paved area. The costs for formation preparation were assumed to be lower than for a “pure” Greenfield site. The signalling costs were based on extending the colour light block signalling in Hereford Station as far south as the proposed junction. The track layout of the site itself would also need to take signalling aspects into account and would incorporate a trap siding to protect the main line.

Civil engineering costs were estimated in the region of £1,200,000. Signalling costs were based on a range of £200,000 and £800,000.



Rotherwas – National Track Layout

Figure 4.2



Rotherwas Freight Site Plan

Figure 4.7

Appendix B TEE, PA and AMCB Tables

Option 1: Leominster to Rotherwas
Table 1: Economic Efficiency of Transport System (revenues are scored as positives, costs as negatives)

	All Modes Total	Road Cars, LGVs and goods vehicles	Bus & Coach Passengers	Rail Total Passengers	Walk and Cycle	Rail Company A e.g. NR	Rail Other e.g. TOC/FOC
Consumers - Commuting							
User benefits							
- travel time saving	18,919,723	6,600,681		12,319,043			12,319,043
- Vehicle opcost	-			-			
- user charges	-			-			
- during construction & maintenance	-			-			
Net Consumer Benefits (1a)	**18,919,723**	6,600,681		12,319,043			12,319,043
				-			
Consumers - Other							
User Benefits							
- travel time saving	16,724,930	5,834,965		10,889,965			10,889,965
- Vehicle opcost	-			-			
- user charges	-			-			
- during construction & maintenance	-			-			
Net Consumer Benefits (1b)	**16,724,930**	5,834,965	-	10,889,965		-	10,889,965
Business							
User benefits							
- Travel time	2,066,575	720,983		1,345,592			1,345,592
- Vehicle opcost	-			-			
- Reduced absenteeism	279,358			279,358			
- user charges	-			-			
- during construction & maintenance	-			-			
Net Business User Benefits (2)	**2,345,933**	720,983	-	1,624,950	-	-	1,345,592
Private sector provider impact							
- revenue	13,840,990			13,840,990			13,840,990
- opcost	- 65,179,110			- 65,179,110			-65,179,110
- investment cost	-			-			
- grant/subsidy	51,338,121			51,338,121			51,338,121
- revenue transfer	-			-			
Sub total (3)	**-**	-	-	-		-	-
Other impacts							
- Developer contribution (4)		-	-	-			
Net business impact (5 = 2+3+4)	**2,345,933**	720,983	-	1,624,950	-		
Total, PV of transport econ eff. Benefits (6 = 1a + 1b + 5)	**37,990,586**						

Note that subtotals (1a + 1b) and (5) flow into the AMCB table. Subtotal (6) does not.

Option
Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes Total	Road Infrastructure	Bus & Coach	Rail	Walk and Cycle
Local Government funding					
- Direct Revenue	-				
- Operating costs	-				
- Investment costs	- 81,062	-81,062			
- Developer and other contributions	-				
- Grant/Subsidy (k)*	-				
- Revenue transfer	-				
Net (7)	**- 81,062**	- 81,062	-	-	
Central Government funding: Transport					
- Direct Revenue	-				
- Operating costs	-				
- Investment costs*	18,066,614			18,066,614	
- Developer and other contributions	-				
- Grant/Subsidy (k)*	51,338,121			51,338,121	
- Indirect Tax Revenues					
- Revenue transfer	-				
Net (8)	**69,404,734**	-	-	69,404,734	
Central Government Funding: Non-Transport					
Indirect tax Revenues (9)	**1,278,446**	1,278,446			
Totals					
Broad Transport Budget (10 = 7 + 8)	**69,323,672**				
Wider Public Finances (11 = 9)	**1,278,446**				

Option 1: Leominster to Rotherwas
Table 3: Analysis of Monetised Costs and Benefits (AMCB)

	Total	Road	Bus & Coach	Rail	Walk and Cycle
Noise	121,593			121,593	
Local air quality	-	0			
Greenhouse gases	364,779	364,779			
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	-				
Accidents (incl. safety)	2,246,092	1,864,426		381,666	
Physical Fitness	10,581,001			10,581,001	
Economic Efficiency: Consumers Users (Commuting) (1a)	18,919,723	6,600,681		12,319,043	
Economic Efficiency: Consumers Users (Other) (1b)	16,724,930	5,834,965	0	10,889,965	
Economic Efficiency: Business users and providers (5)	2,345,933	720,983	0	1,624,950	
Wider Public Finances (indirect Taxation Revenues (-11)	- 1,278,446				
Reliability (incl. performance & reliability)	-				
Option values	-				
Interchange (station quality and crowding)	-				
Present Value of Benefits (PVB) (sum all benefits - 11)	**50,025,605**				
Broad Transport Budget (10)	69,323,672				
Present Value of Costs (PVC) (10)	**69,323,672**				
Overall Impacts					
Net Present Value (NPV)	**-19,298,067**				
Benefit to Cost Ratio (BCR)	**0.72**				

Option 2: Leominster to Holme Lacy
Table 1: Economic Efficiency of Transport System (revenues are scored as positives, costs as negatives)

	All Modes Total	Road Cars, LGVs and goods vehicles	Bus & Coach Passengers	Rail Total Passengers	Walk and Cycle	Rail Company A e.g. NR	Rail Other e.g. TOC/FOC
Consumers - Commuting							
User benefits							
- travel time saving	20,147,485	6,996,777		13,150,708			13,150,708
- Vehicle opcost	-			-			
- user charges	-			-			
- during construction & maintenance	-			-			
Net Consumer Benefits (1a)	**20,147,485**	6,996,777		13,150,708			13,150,708
				-			
Consumers - Other							
User Benefits							
- travel time saving	17,810,264	6,185,111		11,625,153			11,625,153
- Vehicle opcost	-			-			
- user charges	-			-			
- during construction & maintenance	-			-			
Net Consumer Benefits (1b)	**17,810,264**	6,185,111	-	11,625,153		-	11,625,153
Business							
User benefits							
- Travel time	2,200,682	764,248		1,436,434			1,436,434
- Vehicle opcost	-			-			
- Reduced absenteeism	298,358			298,358			
- user charges	-			-			
- during construction & maintenance	-			-			
Net Business User Benefits (2)	**2,499,040**	764,248	-	1,734,791	-	-	1,436,434
Private sector provider impact							
- revenue	14,718,840			14,718,840			14,718,840
- opcost	- 68,972,762			- 68,972,762			-68,972,762
- investment cost	-			-			
- grant/subsidy	54,253,921			54,253,921			54,253,921
- revenue transfer	-			-			
Sub total (3)	**-**	-	-	-		-	-
Other impacts							
- Developer contribution (4)		-	-	-			
Net business impact (5 = 2+3+4)	**2,499,040**	764,248	-	1,734,791	-		
Total, PV of transport econ eff. Benefits (6 = 1a + 1b + 5)	**40,456,788**						

Note that subtotals (1a + 1b) and (5) flow into the AMCB table. Subtotal (6) does not.

Option 2: Leominster to Holme Lacy
Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes Total	Road Infrastructure	Bus & Coach	Rail	Walk and Cycle
Local Government funding					
- Direct Revenue	-				
- Operating costs	-				
- Investment costs	- 85,926	-85,926			
- Developer and other contributions	-				
- Grant/Subsidy (k)*	-				
- Revenue transfer	-				
Net (7)	**- 85,926**	- 85,926	-	-	
Central Government funding: Transport					
- Direct Revenue	-				
- Operating costs	-				
- Investment costs*	97,609,898			97,609,898	
- Developer and other contributions	-				
- Grant/Subsidy (k)*	54,253,921			54,253,921	
- Indirect Tax Revenues					
- Revenue transfer	-				
Net (8)	**151,863,819**	-	-	151,863,819	
Central Government Funding: Non-Transport					
Indirect tax Revenues (9)	**1,355,164**	1,355,164			
Totals					
Broad Transport Budget (10 = 7 + 8)	**151,777,893**				
Wider Public Finances (11 = 9)	**1,355,164**				

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Option 2: Leominster to Holme Lacy
Table 3: Analysis of Monetised Costs and Benefits (AMCB)

	Total	Road	Bus & Coach	Rail	Walk and Cycle
Noise	128,890			128,890	
Local air quality	-	0			
Greenhouse gases	386,669	386,669			
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	-				
Accidents (incl. safety)	2,380,876	1,976,307		404,569	
Physical Fitness	11,300,648			11,300,648	
Economic Efficiency: Consumers Users (Commuting) (1a)	20,147,485	6,996,777		13,150,708	
Economic Efficiency: Consumers Users (Other) (1b)	17,810,264	6,185,111	0	11,625,153	
Economic Efficiency: Business users and providers (5)	2,499,040	764,248	0	1,734,791	
Wider Public Finances (indirect Taxation Revenues (-11)	- 1,355,164				
Reliability (incl. performance & reliability)	-				
Option values	-				
Interchange (station quality and crowding)	-				
Present Value of Benefits (PVB) (sum all benefits - 11)	**53,298,707**				
Broad Transport Budget (10)	151,777,893				
Present Value of Costs (PVC) (10)	**151,777,893**				
Overall Impacts					
Net Present Value (NPV)	**-98,479,186**				
Benefit to Cost Ratio (BCR)	**0.35**				