# The Marches Rail Study

## Final Report

Telford & Wrekin Council, Herefordshire Council and Shropshire Council

**26 March 2014**

ATKINS

Plan Design Enable

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## Client signoff

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# 1. Introduction

The Marches region is an area of Britain which is located along and around the border between England and Wales. The Marches region Local Enterprise Partnership (LEP) covers the areas of Herefordshire, Shropshire and Telford & Wrekin Councils. The Local Transport Board (LTB) for the Marches region covers the same geographic area as the LEP.

Shrewsbury is the centre of rail connectivity within the Marches region, providing a gateway to Wales and the West Midlands conurbation. Services from Shrewsbury run to, *inter alia*, Holyhead, Aberystwyth, Manchester, Cardiff and Birmingham. The Towns of Hereford, Shrewsbury and Telford are all within the journey to work area for the West Midlands conurbation, and as such the Shrewsbury – Telford - Birmingham and Hereford – Birmingham lines are important for residents and businesses in the region.

There was no rail investment in the Marches region in Control Period 4 (CP4) and none currently planned for CP5 (as set out in the draft determination from the Office of Rail Regulation). One scheme which was planned for CP4 (Wolverhampton to Shrewsbury linespeed improvements) was not delivered due to a lack of funding. This means that there will have been no investment in the Marches region rail network for up to ten years, with the earliest for potential investment being 2019 at the start of CP6.

The purpose of this study has been to identify a prioritised list of improvements for passenger and freight services in the Marches region, taking into account potential passenger growth, in order that rail can continue to support economic expansion in the region. This list will then determine the potential rail schemes (in the form of conditional outputs) that are operationally deliverable and provide the biggest value for money benefits to passengers in the region and the wider economy.

The identified conditional outputs will provide the Marches region LEP and LTB with a strong evidence base for scheme prioritisation in the Strategic Economic Plan (SEP), and a base from which to work with rail industry and governmental partners to fund and deliver improvements – in particular Centro, Department for Transport (DfT), Network Rail and the Welsh Government.

This report draws together the three previously issues technical notes for this study, and is structured as follows:

- A review of the rail network and service provision in the Marches region is presented in Chapters 2 to 4;
- A detailed methodology for forecasting potential passenger growth in the region can be found in Chapter 5, alongside the results of this analysis; and
- The findings of the study, including conditional outputs, a prioritised list of schemes and recommendations is presented in Chapter 6 and summarised in Chapter 7.

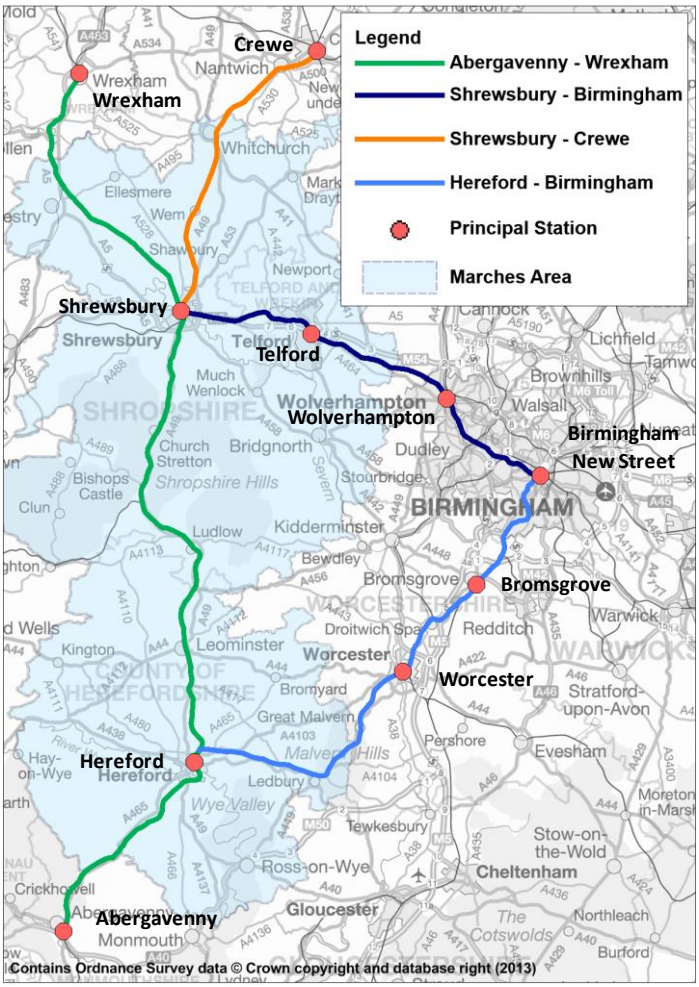
# 2. Route Descriptions

## 2.1. Scope

The scope of this study is shown in Figure 2.1, covering:

- The Marches line between Abergavenny and Wrexham;
- The Shrewsbury to Birmingham New Street line;
- The Hereford to Birmingham New Street line; and
- The Shrewsbury to Crewe line.

**Figure 2.1 Routes Considered in this Study**

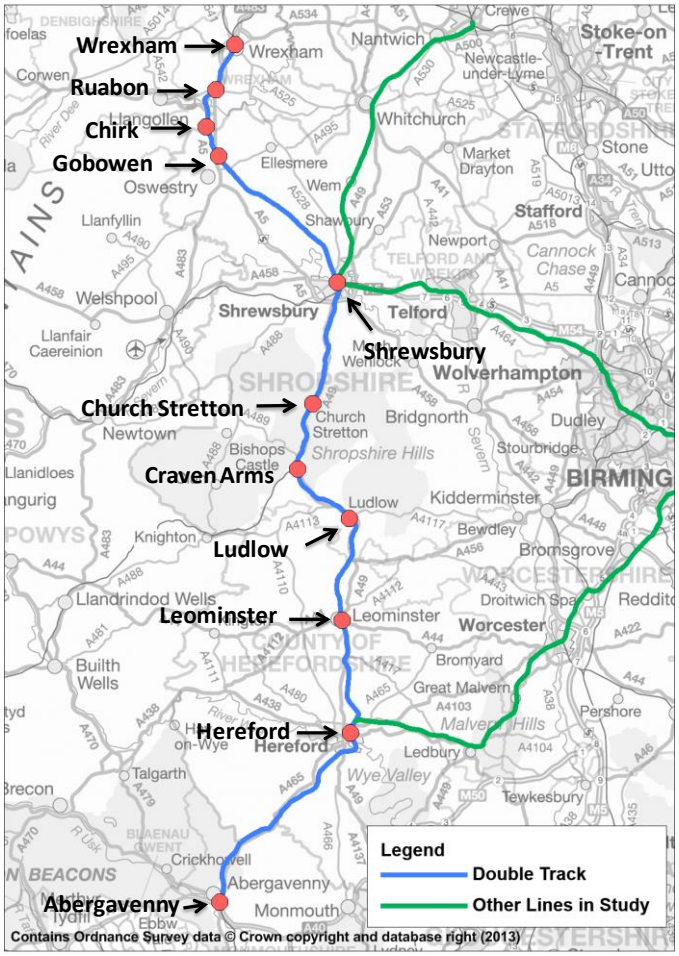


## 2.2. Marches Line

The core Marches line extends from Abergavenny in south Wales through to Wrexham, via the principle stations of Hereford and Shrewsbury. This route is approximately 105 miles in length and is comprised of double track. A detailed route map is shown in Figure 2.2 below.

The Marches line is a key rail link between Wales, Northern England (to Manchester via Crewe) and the Midlands. The line also connects South Wales to North Wales, with Arriva Trains Wales (ATW) operating a Cardiff Central to Llandudno service via the Marches line.

**Figure 2.2 Marches Line**




Work to improve the line between Shrewsbury and Wrexham was completed in September 2013. The upgrade to the line included the replacement and realignment of track on the route so to improve passenger comfort, reduce noise levels and allow for faster journey times[1+2].

[1] Work begins on Wrexham to Shrewsbury line (Transport Research Laboratory, 2013) http://www.trl.co.uk/trl-news-hub/transport-news/latest-transport-news/work-begins-on-wrexham-to-shrewsbury-line_801630418.htm
[2] Shrewsbury to Wrexham upgrade complete, says Network Rail (Shropshire Star, 2013) http://www.shropshirestar.com/news/2013/11/21/shrewsbury-to-wrexham-upgrade-complete-says-network-rail/

## 2.3. Shrewsbury to Birmingham Line

The Shrewsbury to Birmingham route comprises approximately 42 miles of double track railway, taking in the principle stations of Shrewsbury, Telford Central, Wolverhampton and Birmingham New Street. A detailed route map is shown in Figure 2.3.

**Figure 2.3 Shrewsbury to Birmingham Line**

## 2.4. Hereford to Birmingham Line

The Hereford to Birmingham route is approximately 55 miles in length, with varying track formations, including:

- Approximately 18 miles of single track between Shelwick Junction and Malvern Wells, with a short loop at Ledbury station which is located 12 miles from Shelwick Junction;
- A short section of single track between Droitwich Spa and Stoke Works Junction;
- Four tracking (Up and Down, Slow and Fast lines) for approximately 4 miles between Halesowen Junction and Kings Norton, with Hereford to Birmingham services running on the fast lines; and
- The remaining route is double track.

A map showing the Hereford-Birmingham route is presented in Figure 2.4, including those stations called at by Hereford-Birmingham services.

**Figure 2.4 Hereford to Birmingham Line**

# 3. Service Provision and Passenger Capacity

This chapter considers the existing service provision and passenger capacity on the routes covered by the study.

## 3.1. Service Provision

Table 3.1 shows the typical number of trains operating on the four routes during a weekday AM peak, PM peak and standard hour.

**Table 3.1 Current Service Levels**

| Origin | Destination | Arriving Before 0900 | Departing between 1600 and 1800 | Standard hour frequency |
|---|---|---|---|---|
| **Shrewsbury – Birmingham Route** | | | | |
| Birmingham New Street | Shrewsbury | 4 | 5 | 2 TPH |
| Shrewsbury | Birmingham New Street | 8 | 4 | 2 TPH |
| Birmingham New Street | Wrexham | 1 | 1 | 0.5 TPH |
| Wrexham | Birmingham New Street | 1 | 1 | 0.5 TPH |
| **Shrewsbury – Crewe Route** | | | | |
| Shrewsbury | Crewe | 4 | 3 | 1.5 TPH |
| Crewe | Shrewsbury | 6 | 3 | 1.5 TPH |
| **Hereford – Birmingham Route** | | | | |
| Birmingham New Street | Hereford | 1 | 3 | 1 TPH |
| Hereford | Birmingham New Street | 1 | 2 | 1 TPH |
| Worcester | Hereford | 2 | 2 | 1 TPH[3] |
| Hereford | Worcester | 5 | 2 | 1 TPH |
| **Marches Line** | | | | |
| Hereford | Shrewsbury | 4 | 3 | 1.5 TPH |
| Shrewsbury | Hereford | 6 | 3 | 1.5 TPH |
| Hereford | Wrexham | 1 | 1 | 0.5 TPH |
| Wrexham | Hereford | 2 | 1 | 0.5 TPH |
| Shrewsbury | Wrexham | 5 | 2 | 1 TPH |
| Wrexham | Shrewsbury | 4 | 2 | 1 TPH |

[3] In some hours of the day, a second service runs between Hereford and Worcester (and on to London Paddington), operated by First Great Western (FGW).

## 3.2. Passenger Capacity

Table 3.2 presents the seated passenger capacity on the three main routes covered by this study, using data provided by ATW and London Midland (LM) and unit seating capacity information obtained from Angel Train Leasing[4] and Porterbrook[5].

**Table 3.2 Seated Passenger Capacity**

| From | To | Total Daily Capacity (seated) | AM Peak Capacity[6] (seated) | PM Peak Capacity[7] (seated) |
|---|---|---|---|---|
| Shrewsbury | Birmingham | 3760 | 1120 | 320 |
| Birmingham | Shrewsbury | 3520 | 440 | 640 |
| Shrewsbury | Hereford | 4900 | 1150 | 620 |
| Hereford | Shrewsbury | 4900 | 750 | 670 |
| Hereford | Birmingham[8] | 3060 | 320 | 340 |
| Birmingham | Hereford[9] | 2960 | 200 | 810 |

On the Shrewsbury to Birmingham route, LM operates two, three and four car sets. Data provided by LM suggests capacity may be an issue on peak hour services with high level of passenger demand, particularly into and out of Birmingham, though no services currently operate with passengers in excess of capacity. The data indicates that in the future passenger capacity may be a constraint on rail usage on the route and as such increasing the service frequency and/or adding additional carriages to current services could be considered to meet demand.

Between Hereford and Birmingham LM generally operate two and three car services, with four and five car services operating on the busier services. There is only one AM peak service from Hereford into Birmingham arriving before 0900 which is operated by a 5 car set which experiences a high train load in excess of seated capacity. However there are four services from Great Malvern and one from Worcester Shrub Hill which arrives into Birmingham before 0900, meeting demand from commuters. In the afternoon and PM peak, load factors are relatively high leaving Birmingham but generally fall beyond University and Bromsgrove. As with the Shrewsbury to Birmingham line, the data does not currently suggest a serious passenger capacity issue, with no services operating with passengers in excess of capacity. However, any future increase in patronage on the line could be restricted as services become increasingly crowded, with train lengthening and increasing service frequency being potential ways of tackling this problem.

Passenger capacity on the Shrewsbury Hereford route is relatively high, however information provided by ATW suggest that many services are full and standing but only in small sections between Ludlow to Hereford and Church Stretton to Shrewsbury, with the school flow being a particular cause of high passenger loads.

[4] http://www.angeltrains.co.uk/Products-Services/Regional-Passenger-Trains
[5] http://www.porterbrook.co.uk/pages/library.html
[6] Arriving before 0900
[7] Departing between 1600 and 1800
[8] Excludes services on the Hereford-Birmingham line which start at Worcester Shrub Hill and Great Malvern
[9] Excludes services on the Hereford-Birmingham line which terminate at Worcester Shrub Hill and Great Malvern

# 4. Route Details

More specific details of the routes covered in this study are detailed in this chapter, including:

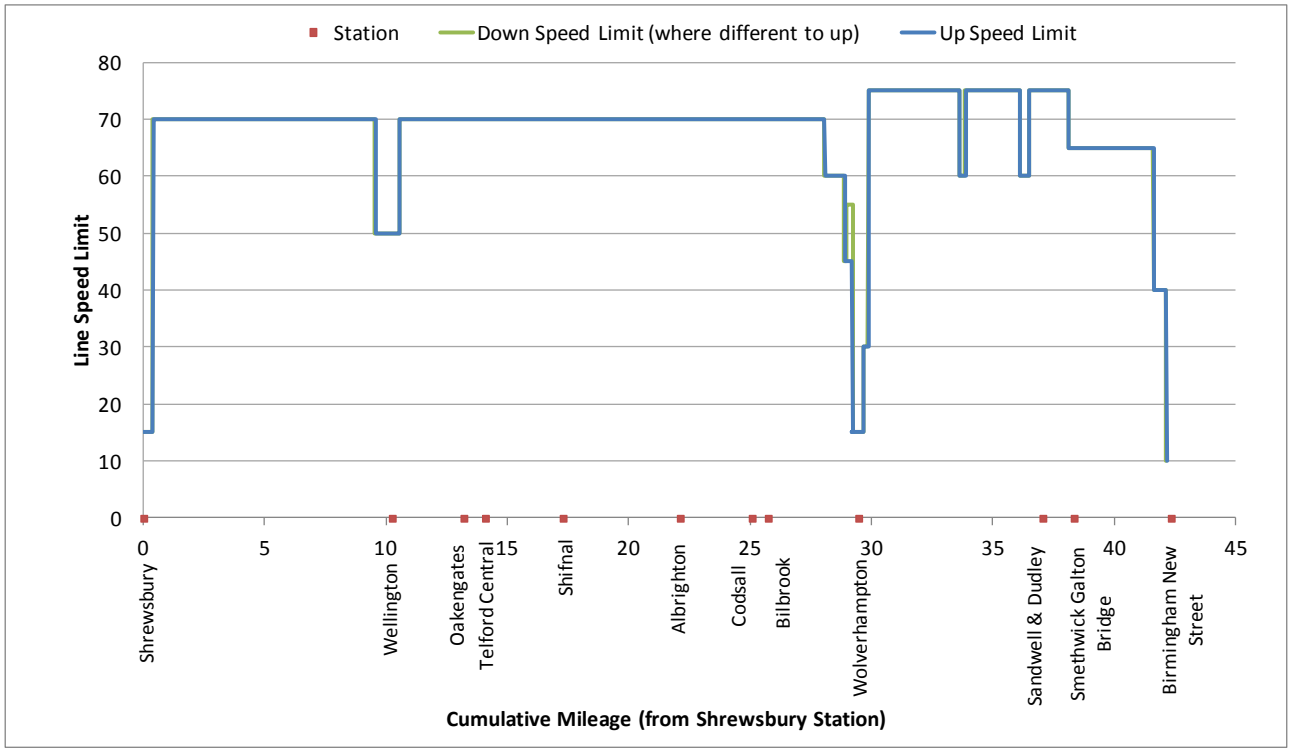
- Line speeds;
- The theoretical line capacity;
- Platform lengths;
- Station facilities and usage;
- Loading gauges; and
- Freight movements.

## 4.1. Line Speeds

The line speeds on the Shrewsbury to Birmingham route, as shown in Figure 4.1, are relatively high, with the Shrewsbury to Wolverhampton route operating almost continuously at 70mph, with a slight reduction to 50mph through Wellington station. Between Wolverhampton and Smethwick Galton Bridge the line reaches a maximum speed limit of 75mph, though this is interrupted by 60mph limits.

There is an ongoing study to determine the capacity enhancements required to increase much of the line to 90mph running so to increase capacity, reduce journey times and improve operational resilience and flexibility.

**Figure 4.1 Shrewsbury to Birmingham Line Speeds**

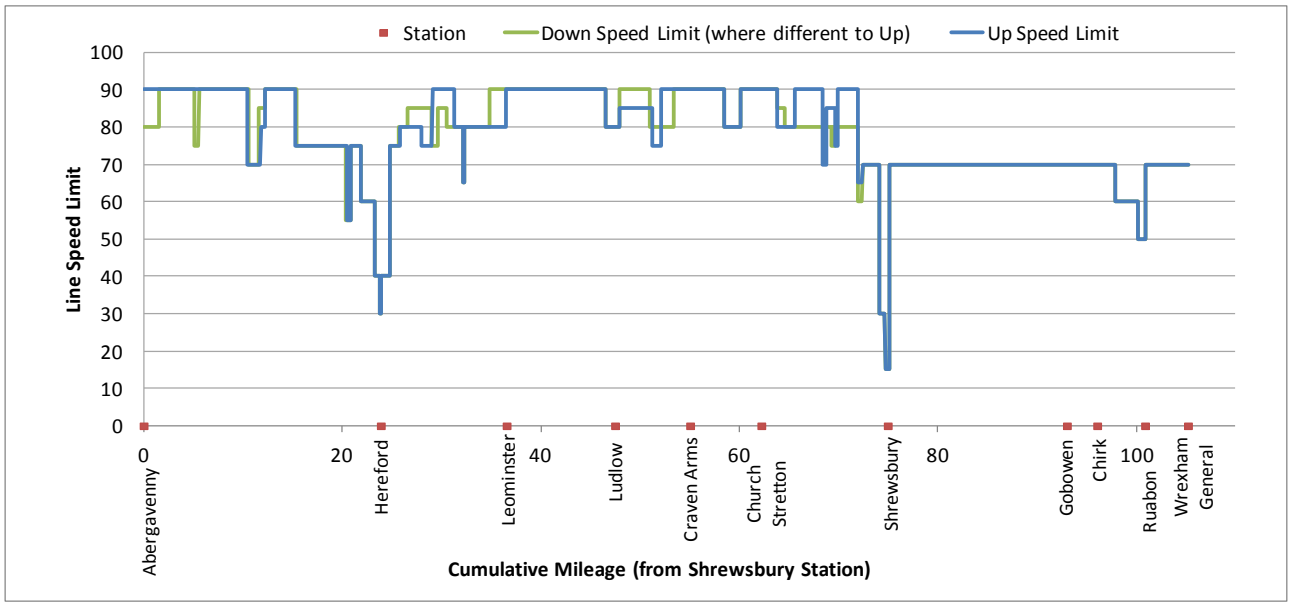



The line between Abergavenny and Wrexham is approximately 105 miles in length and has over 60 level crossings (a mixture of automatic, manned and user worked). Line speeds on this route are shown in Figure 4.2.

Between Abergavenny and Hereford much of the line operates at 90mph, though there are sections in both the Up and Down directions where this fluctuates. On the approach to Hereford the line speed falls to 75mph before a small section of track at 55mph. The core section of the Marches line between Hereford and Shrewsbury operates at varying line speeds, though principally between 80mph and 90mph. However there

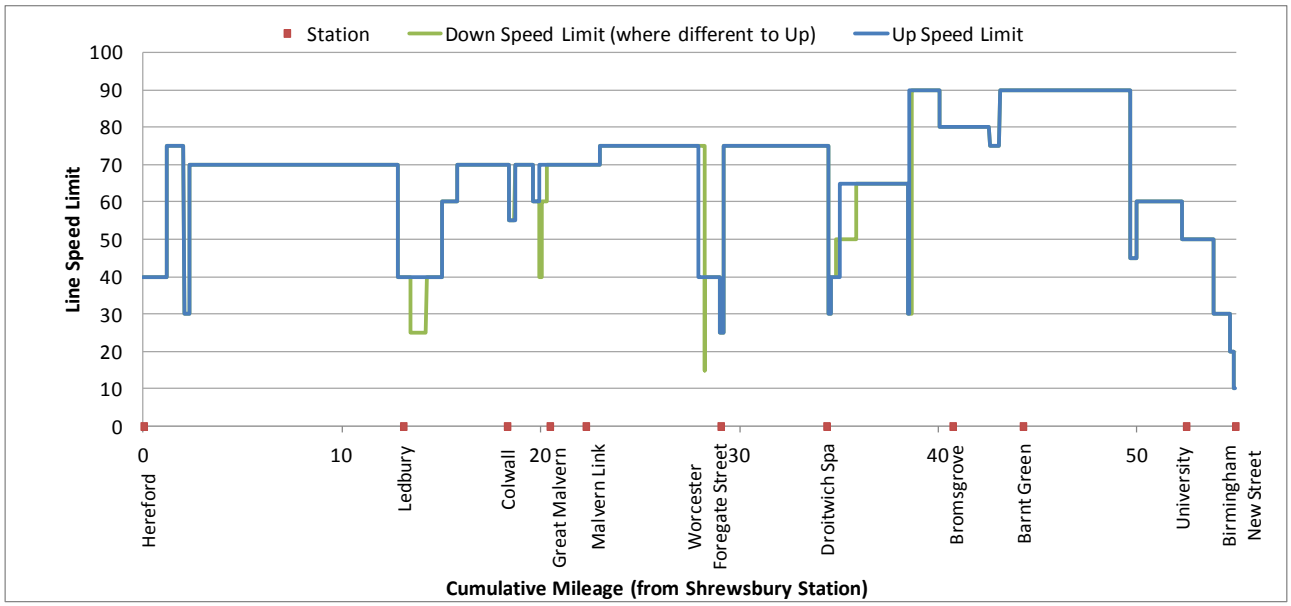
are sections where the line speeds falls to as 65mph-70mph. Beyond Shrewsbury the line operates at 70mph through to Wrexham, though this is interrupted by a section of 50mph line at Ruabon.

**Figure 4.2 Marches Route Line Speeds**




Line speeds on the Hereford to Birmingham route are relatively low and fluctuate considerably, as shown in Figure 4.3. Between Hereford and Ledbury the track is mostly 70mph running, before a stretch of 40mph line through Ledbury (falling as low as 25mph in the down direction for a short period). Line speeds then increase to between 70mph and 75mph through to Droitwich Spa, though there are several instances where this falls considerably. Between Droitwich Spa and Stoke Works Junction the line speed is 65mph, falling to 30mph through the junction. Between Bromsgrove and Barnt Green line speeds are 75mph-90mph, increasing to 90mph for several miles before falling on the approach to University and Birmingham New Street.

**Figure 4.3 Hereford to Birmingham Line Speeds**




## 4.2. Theoretical Line Capacity

Line capacity is constrained by the form of signalling system in operation which determines the minimum headway values for a section of route. The line capacity calculations detailed below were made using the minimum headway values as per the 2014 Timetable Planning Rules published by Network Rail.

The theoretical capacity (in number of trains per hour (tph)) for each track was obtained using the following formula:

$$Theoretical\ capacity\ (tph) = \frac{60}{minimum\ headway}$$

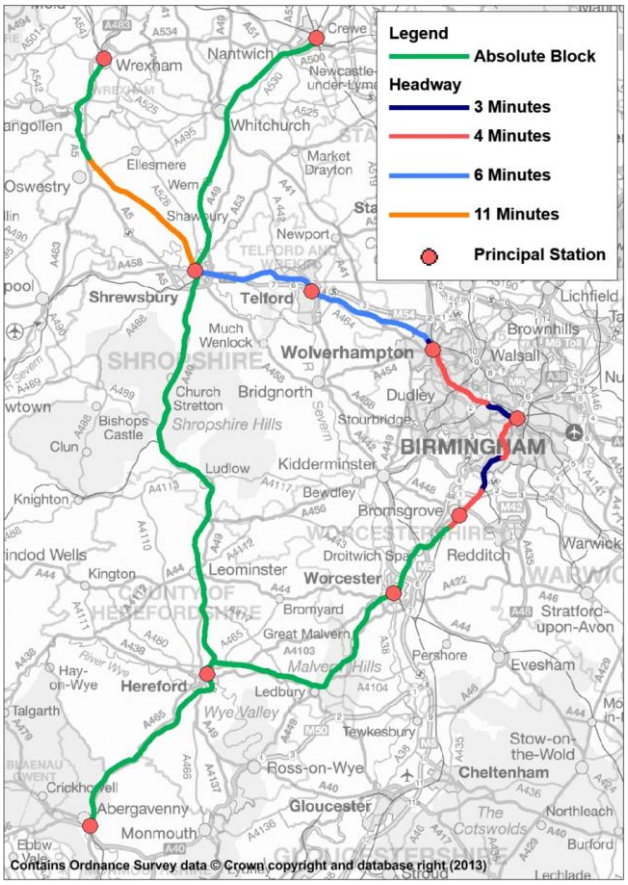
On some section of route, absolute block signalling is in use. Absolute block works by allowing only one train to occupy a defined section of a route at a time, as controlled by a signaller. Where absolute block is in operation, the Timetable Planning Rules do not dictate a minimum headway, rather that capacity of the line is constrained by the length of block sections and the time taken for a train to pass through a block section. In such instances, the working timetable has been examined so to calculate station-to-station sectional running times, which were then used to calculate the theoretical line capacity as below:

$$Theoretical\ capacity\ (tph) = \frac{60}{sectional\ running\ time + 2\ minutes}$$

Current line usage data has been extracted from a live train tracker and includes both passenger and freight services. Given the nature of freight train operation (services are often cancelled, added or amended at short notice) the line usage data is an estimate of current line use.

Figure 4.4 presents the minimum headway values and absolute block sections of the lines covered by this study.

**Figure 4.4 Minimum Headway Values and Absolute Block Sections**




The following tables present an analysis of the capacity and utilisation of the lines through the Marches region. For our analysis we have examined Network Rail's working time tables and real time train usage information to gauge the busiest periods along each of the routes. This provides the most robust estimate of the theoretical capacity of each route.

**Table 4.1 Marches Route Current Line Usage and Spare Capacity (0800-09:00)**

| | | | | | Up *(to Wrexham)* | | Down *(to Abergavenny)* | |
|---|---|---|---|---|---|---|---|---|
| **Section** | **Direction** | **Headway (mins)** | | **Current Theoretical Capacity per Line** | **Current Line Usage** | **Theoretical Spare Capacity** | **Current Line Usage** | **Theoretical Spare Capacity** |
| Tram Inn - Hereford | Up & Down | AB | 9 | 6 | 3 | 3 | 3 | 3 |
| Hereford - Moreton on Lugg | Up & Down | AB | 7 | 8 | 1 | 7 | 3 | 5 |
| Moreton on Lugg - Leominster | Up & Down | AB | 9 | 6 | 2 | 4 | 2 | 4 |
| Leominster - Woofferton | Up & Down | AB | 8 | 7 | 2 | 5 | 2 | 5 |
| Woofferton - Ludlow | Up & Down | AB | 6 | 10 | 2 | 8 | 2 | 8 |
| Ludlow - Bromfield | Up & Down | AB | 5 | 12 | 2 | 9 | 2 | 9 |
| Bromfield - Craven Arms | Up & Down | AB | 6 | 10 | 2 | 8 | 3 | 7 |
| Craven Arms - Marsh Brook | Up & Down | AB | 7 | 8 | 4 | 4 | 3 | 5 |
| Marsh Brook - Church Stretton | Up & Down | AB | 5 | 12 | 2 | 10 | 3 | 9 |
| Church Stretton - Dorrington | Up & Down | AB | 8 | 7 | 2 | 5 | 2 | 5 |
| Dorrington - Sutton Bridge Jn | Up & Down | AB | 6 | 10 | 2 | 8 | 2 | 8 |
| Sutton Bridge Jn - Shrewsbury | Up & Down | AB | 5 | 12 | 2 | 10 | 2 | 10 |
| Shrewsbury - Gobowen | Up & Down | 11 | | 5 | 2 | 3 | 2 | 3 |
| Gobowen - Chirk | Up & Down | AB | 6 | 10 | 1 | 9 | 2 | 8 |
| Chirk - Ruabon | Up & Down | AB | 7 | 8 | 1 | 7 | 2 | 6 |
| Ruabon - Wrexham General | Up & Down | AB | 8 | 7 | 1 | 6 | 1 | 6 |

The busiest period of use on the Marches line was between 0800 and 0900. Most of the route is currently signalled in absolute block sections which restrict the ultimate capacity of the route. Table 3 highlights that sections of the route have quite a high capacity. In practice the route's capacity is determined by the most restrictive section of the route. In this case there are sections between Hereford and Shrewsbury which have a theoretical capacity of 6tph per direction. This will determine in an operational perspective the utilisation of the whole route. Even with this level of capacity, the current pattern of usage does indicate that there is the capacity to operate more trains over the route should this be required. However, it should be noted that even though there is the theoretical spare capacity of 3tph, in practical terms this could equate to a single additional freight service (per direction) and maybe one or two limited stop passenger services. A planned major renewal of the signalling along the Marches line will provide more capacity and flexibility along the route which will need to be considered in a future stage of this project.

**Table 4.2 Hereford to Birmingham Route Current Line Usage and Spare Capacity (0900-10:00)**

| | | | | | Up *(towards Birmingham)* | | Down *(away from Birmingham)* | |
|---|---|---|---|---|---|---|---|---|
| **Section** | **Direction** | **Headway (mins)** | | **Current Theoretical Capacity per Line** | **Current Line Usage** | **Theoretical Spare Capacity** | **Current Line Usage** | **Theoretical Spare Capacity** |
| Hereford - Shelwick Jn | Up & Down | AB | 5 | 12 | 5 | 7 | 2 | 10 |
| Shelwick Jn - Ledbury | Single Line - Up & Down | AB | 15 | 4 | 2 | 0 | 2 | 0 |
| Ledbury - Colwall | Single Line - Up & Down | AB | 9 | 6 | Current line usage: 4<br>Theoretical spare capacity: 2 | | | |
| Colwall - Malvern Wells | Single Line - Up & Down | | | | | | | |
| Malvern Wells - Great Malvern | Up & Down | AB | 4 | 15 | 2 | 13 | 2 | 13 |
| Great Malvern - Malvern Link | Up & Down | AB | 4 | 14 | 2 | 12 | 2 | 12 |
| Malvern Link - Newland East | Up & Down | AB | 4 | 14 | 2 | 12 | 2 | 12 |
| Newland East - Henwick | Up & Down | AB | 6 | 10 | 3 | 7 | 2 | 8 |
| Henwick - Worcester Foregate St | Up & Down | AB | 3 | 20 | 3 | 17 | 2 | 18 |
| Worcester Foregate St - Tunnel Jn | Up & Down | AB | 5 | 12 | 1 | 11 | 1 | 11 |
| Tunnel Jn - Droitwich Spa | Up & Down | AB | 7 | 8 | 4 | 4 | 2 | 6 |
| Droitwich Spa - Stoke Works Junction | Single Line - Up & Down | AB | 8 | 7 | 2 | 5 | 1 | 6 |
| Stoke Works Junction - Bromsgrove | Up & Down | 4 | | 15 | 6 | 9 | 6 | 9 |
| Bromsgrove - Barnt Green | Up & Down | 4 | | 15 | 8 | 7 | 4 | 11 |
| Barnt Green - Kings Norton | Up & Down Fast | 3 | | 20 | 6 | 14 | 4 | 16 |
| Kings Norton - University | Up & Down | 4 | | 15 | 8 | 7 | 8 | 7 |
| University - Birmingham New Street | Up & Down | 4 | | 15 | 10 | 5 | 8 | 7 |

The busiest period of use on the Hereford - Birmingham, route was between 0900 and 1000. The route is a mixture of single and double line, absolute block and headway based operation. Table 4 highlights that sections of the route have quite a high theoretical capacity. In practice the route's capacity is determined by the most restrictive section of the route. In this case there are sections between Hereford and Birmingham (Single Line) which have a theoretical capacity of 4tph (both directions). Even with this level of capacity, the current pattern of usage does indicate that there is the potential capacity to operate more trains over some parts of the route. However, the single track section between Shelwick Junction and Ledbury is currently operating at maximum capacity which does constrain the potential of

operating more services along this route. Therefore, if additional capacity is required, it may be better to provide this via train lengthening as this is likely to be more cost effective than re-doubling this section of the route.

**Table 4.3 Shrewsbury to Birmingham Route Current Line Usage and Spare Capacity (0800-09:00)**

| | | | | Up *(towards Birmingham)* | | Down *(away from Birmingham)* | |
|---|---|---|---|---|---|---|---|
| **Section** | **Direction** | **Headway (mins)** | **Current Theoretical Capacity per Line** | **Current Line Usage** | **Theoretical Spare Capacity** | **Current Line Usage** | **Theoretical Spare Capacity** |
| Shrewsbury - Wellington | Up & Down | 6 | 10 | 3 | 7 | 2 | 8 |
| Wellington - Oakengates | Up & Down | 6 | 10 | 2 | 8 | 3 | 7 |
| Oakengates - Telford Central | Up & Down | 6 | 10 | 2 | 8 | 4 | 6 |
| Telford Central - Madeley Jn | Up & Down | 6 | 10 | 2 | 8 | 3 | 7 |
| Madeley Jn - Shifnal | Up & Down | 6 | 10 | 2 | 8 | 3 | 7 |
| Shifnal - Cosford | Up & Down | 6 | 10 | 2 | 8 | 3 | 7 |
| Cosford - Albrighton | Up & Down | 6 | 10 | 2 | 8 | 2 | 8 |
| Albrighton - Codsall | Up & Down | 6 | 10 | 2 | 8 | 2 | 8 |
| Codsall - Bilbrook | Up & Down | 6 | 10 | 2 | 8 | 2 | 8 |
| Bilbrook - Stafford Road Jn | Up & Down | 6 | 10 | 3 | 7 | 3 | 7 |
| Stafford Road Jn - Wolverhampton | Up & Down | 3 | 20 | 8 | 12 | 6 | 14 |
| Wolverhampton - Galton Junction | Up & Down | 4 | 15 | 11 | 4 | 10 | 5 |
| Galton Junction - Birmingham | Up & Down | 3 | 20 | 11 | 9 | 9 | 11 |

The busiest period of use on the Shrewsbury - Birmingham route was between 0800 and 0900. The route has multiple aspect colour light signalling with most sections having 6 minute headways between services. Table 5 highlights that the route has quite a high theoretical capacity. In practice the route's capacity is determined by the most restrictive section of the route. In this case there section between Stafford Road Junction and Shrewsbury has a theoretical capacity of 10tph per direction. Even with this level of capacity, the current pattern of usage does indicate that there is the capacity to operate more trains over the route should this be required, the main constraint to this being the utilisation of the route between Wolverhampton and Birmingham which is operationally constrained. Discussions with Network Rail have

indicated that there are not any available spare paths between Wolverhampton and Birmingham New Street available in the peak hours; however other destinations/routings may be available and should be considered in a future stage of this project.

## 4.3. Stations

### 4.3.1. Platform Lengths

Tables 4.4 to 4.6 present the various lengths of platforms available on the Shrewsbury to Birmingham, Hereford to Birmingham and Marches routes, respectively. Platform lengths have been obtained from the Network Rail Sectional Appendix (2013). Given the size of Birmingham New Street and that 10 of the 13 platforms at the station are a minimum of 300 metres in length, the station has been omitted from the tables below.

**Table 4.4 Shrewsbury to Smethwick Galton Bridge Platform Lengths**

| Station | Platform | Length (metres) |
|---|---|---|
| Shrewsbury[10] | 3 (Down) | 263 |
| | 4 (Up and Down) | 308 |
| | 5 (Down Bay) | 130 |
| | 6 (Down Bay) | 130 |
| | 7 (Up Platform) | 309 |
| Wellington | 1 (Up) | 136 |
| | 2 (Down) | 201 |
| | 3 (Bay) | 92 |
| Oakengates | Up | 78 |
| | Down | 78 |
| Telford Central | Up | 271 |
| | Down | 271 |
| Shifnal | Up | 115 |
| | Down | 83 |
| Cosford | Up | 122 |
| | Down | 122 |
| Albrighton | Up | 138 |
| | Down | 92 |
| Codsall | Up | 97 |
| | Down | 94 |
| Bilbrook | Up | 64 |
| | Down | 68 |
| Wolverhampton | 1 (Down) | 267 |
| | 2 (Up and Down) | 270 |
| | 3 (Up) | 239 |
| | 4 (Up) | 279 |
| | 5 (South Bay) | 86 |
| | 6 (North Bay) | 120 |

[10] Platform 1 and 2 at Shrewsbury station are not in use.

| | | |
|---|---|---|
| Sandwell & Dudley | Up | 272 |
| | Down | 271 |
| Smethwick Galton Bridge | Up | 151 |
| | Down | 149 |

Key items to note are that:

- All platforms are able to accommodate 2 coach trains of 20m and 23m vehicle lengths;
- All stations except Bilbrook can accommodate 3 coach trains of 23m vehicle lengths; and
- All stations except Bilbrook and Oakengates can accommodate 4 coach trains of 20m vehicle lengths.

**Table 4.5 Hereford to University Platform Lengths**

| Station | Platform | Length |
|---|---|---|
| Hereford | 1 (Down) | 205 |
| | 2 (Down) | 204 |
| | 3 (Up) | 221 |
| | 4 (Bay) | 70 |
| Ledbury | Up | 98 |
| | Down | 100 |
| Colwall | Up and Down (one platform station) | 109 |
| Great Malvern | Up | 186 |
| | Down | 128 |
| Malvern Link | Up | 142 |
| | Down | 135 |
| Worcester Foregate Street | 1 (Down) | 152 |
| | 2 (Up) | 152 |
| Droitwich Spa | Up | 127 |
| | Down | 129 |
| Bromsgrove | Up | 76 |
| | Down | 102 |
| Barnt Green | Up | 184 |
| | Down | 186 |
| University | Up | 173 |
| | Down | 185 |

Key items to note are that:

- All platforms are able to accommodate 2 or 3 coach trains of 20m and 23m vehicle lengths; and
- All platforms except Bromsgrove Up can accommodate 4 coach trains of 20m and 23m vehicle lengths.x

**Table 4.6 Abergavenny to Wrexham General Platform Lengths**

| Station | Platform | Length (metres) |
|---|---|---|
| Abergavenny | Up | 246 |
| | Down | 106 |
| Hereford | 1 (Down) | 205 |
| | 2 (Down) | 204 |
| | 3 (Up) | 221 |
| | 4 (Bay) | 70 |
| Leominster | Up | 99 |
| | Down | 97 |
| Ludlow | Up | 132 |
| | Down | 104 |
| Craven Arms | Up | 198 |
| | Down | 134 |
| Church Stretton | Up | 168 |
| | Down | 168 |
| Shrewsbury | 3 (Down) | 263 |
| | 4 (Up and Down) | 308 |
| | 5 (Down Bay) | 130 |
| | 6 (Down Bay) | 130 |
| | 7 (Up Platform) | 309 |
| Gobowen | Up | 166 |
| | Down | 126 |
| Chirk | Up | 157 |
| | Down | 157 |
| Ruabon | Up | 158 |
| | Down | 198 |
| Wrexham General | 1 (Up) | 198 |
| | 2 (Up) | 197 |
| | 3 (Up and Down) | 152 |

It can be seen that all stations can accommodate 4 coach trains of 20m and 23m vehicle lengths.

### 4.3.2. Station Facilities

Table 4.7 shows that on the Shrewsbury to Birmingham line, the principal stations all have ticket offices, CCTV and step free access. However, a number of the smaller stations lack these facilities. Oakengates, Cosford, Codsall and Bilbrook all lack cycle parking spaces, whilst five stations lack station car parking facilities – though alternative parking may be available nearby.

**Table 4.7 Shrewsbury to Birmingham New Street Station Facilities**

| Station | Ticket Office | Car Parking Spaces | Cycle Parking Spaces | CCTV | Step free access coverage |
|---|---|---|---|---|---|
| Shrewsbury | Yes | 145 | 90 | Yes | Yes |
| Wellington | Yes | 109 | 18 | Yes | Yes |
| Oakengates | No | 0 | 0 | Yes | Yes |
| Telford Central | Yes | 182 | 10 | Yes | Yes |
| Shifnal | No | 80 | 10 | Yes | No |
| Cosford | No | 0 | 0 | No | No |
| Albrighton | No | 0 | 5 | No | No |
| Codsall | No | 0 | 0 | No | No |
| Bilbrook | No | 0 | 0 | No | Yes |
| Wolverhampton | Yes | 477 | 275 | Yes | Yes |
| Sandwell & Dudley | Yes | 374 | 20 | Yes | Yes |
| Smethwick Galton Bridge | Yes | 77 | 6 | Yes | Yes |
| Birmingham New Street | Yes | 40 | 46 | Yes | Yes |

From Table 4.8 it can be seen that out of eight stations on the Shrewsbury to Crewe route, five are lacking step free access coverage. Three are also lacking CCTV whilst only Shrewsbury and Crewe stations have ticket offices. Whitchurch and Wrenbury both lack cycle parking provision, whilst Prees, Wrenbury and Nantwich lack car parking facilities.

**Table 4.8 Shrewsbury to Crewe Station Facilities**

| Station | Ticket Office | Car Parking Spaces | Cycle Parking Spaces | CCTV | Step free access coverage |
|---|---|---|---|---|---|
| Shrewsbury | Yes | 145 | 90 | Yes | Yes |
| Yorton | No | 5 | 4 | Yes | No |
| Wem | No | 35 | 8 | Yes | No |
| Prees | No | 0 | 6 | No | No |
| Whitchurch | No | 50 | 0 | No | No |
| Wrenbury | No | 0 | 0 | Yes | Yes |
| Nantwich | No | 0 | 12 | No | No |
| Crewe | Yes | 500 | 275 | Yes | Yes |

Table 4.9 shows that between Hereford and Wrexham, six of the ten stations on the line have ticket offices. Five stations lack step free access whilst Ruabon lacks both car and cycle parking spaces.

**Table 4.9 Hereford to Wrexham Station Facilities**

| Station | Ticket Office | Car Parking Spaces | Cycle Parking Spaces | CCTV | Step free access coverage |
|---|---|---|---|---|---|
| Hereford | Yes | 175 | 50 | Yes | No |
| Leominster | Yes | 0 | 4 | No | Yes |
| Ludlow | Yes | 37 | 10 | No | No |
| Craven Arms | No | 20 | 8 | No | No |
| Church Stretton | No | 22 | 8 | No | Yes |
| Shrewsbury | Yes | 145 | 11 | Yes | Yes |
| Gobowen for Oswestry | Yes | 70 | 10 | No | Yes |
| Chirk | No | 15 | 10 | Yes | No |
| Ruabon | No | 0 | 0 | Yes | No |
| Wrexham General | Yes | 68 | 20 | Yes | Yes |

Table 4.10 shows that on the Hereford to Birmingham line, three of the stations called at by Hereford-Birmingham services lack ticket offices, whilst four lack cycle parking facilities. Over half of stations lack step free access coverage whilst three do not have CCTV.

**Table 4.10 Hereford to Birmingham New Street Station Facilities**

| Station | Ticket Office | Car Parking Spaces | Cycle Parking Spaces | CCTV | Step free access coverage |
|---|---|---|---|---|---|
| Hereford | Yes | 175 | 50 | Yes | No |
| Ledbury | Yes | 50 | 10 | No | No |
| Colwall | No | 20 | 0 | No | Yes |
| Great Malvern | Yes | 122 | 0 | Yes | Yes |
| Malvern Link | Yes | 96 | 12 | Yes | No |
| Worcester Foregate Street | Yes | 0 | 24 | Yes | Yes |
| Droitwich Spa | Yes | 85 | 29 | No | No |
| Bromsgrove | No | 25 | 11 | Yes | No |
| Barnt Green | No | 60 | 0 | Yes | No |
| University | Yes | 0 | 0 | Yes | Yes |
| Birmingham New Street | Yes | 40 | 46 | Yes | Yes |

### 4.3.3. Station Usage

Table 4.11 reveals the change in station usage between 2006/07 and 2011/12 for the principal stations covered by this study.

**Table 4.11 Change in Station Usage 2006/07 to 2011/12**[11]

| | Station | 2006/07 Entries, Exits & Interchanges | 2011/12 Entries, Exits & Interchanges | Change |
|---|---|---|---|---|
| Hereford-Shrewsbury | Hereford | 907,987 | 1,128,400 | +24% |
| | Leominster | 216,889 | 264,639 | +22% |
| | Ludlow | 242,381 | 296,516 | +22% |
| | Craven Arms | 95,505 | 105,117 | +10% |
| | Church Stretton | 111,834 | 119,274 | +7% |
| | Shrewsbury | 1,590,530 | 1,935,538 | +22% |
| | Gobowen | 164,866 | 204,768 | +24% |
| | Chirk | 42,762 | 66,002 | +54% |
| | Ruabon | 46,623 | 82,110 | +76% |
| | Wrexham General | 444,245 | 629,187 | +42% |
| Principal Stations | Telford Central | 795,271 | 1,038,984 | +31% |
| | Birmingham New Street | 18,320,853 | 36,331,362 | +98% |
| | Wolverhampton | 2,674,832 | 4,523,994 | +69% |
| | Crewe | 3,022,627 | 3,538,225 | +17% |
| | Worcester Foregate Street | 1,383,913 | 1,946,702 | +41% |

Key items to note are that:

- Hereford and Shrewsbury stations have seen 24% and 22% increase in passenger usage, respectively;
- Other stations on the Hereford-Shrewsbury line have seen growth as low as 7% (Church Stretton) and as high as 76% (Ruabon); and
- Telford Central has seen passenger usage grow beyond 1 million passengers, a 31% increase; whilst Birmingham New Street has seen passenger demand almost double.

## 4.4. Loading Gauge

The loading gauge refers to the height, width swept path and kinematic enveloped of a train. A summary of the loading gauges on the routes considered in this study is presented in Table 4.12 and shown in Figure 4.5. It can be seen that core Marches line between Hereford and Shrewsbury conforms to W8 gauge.

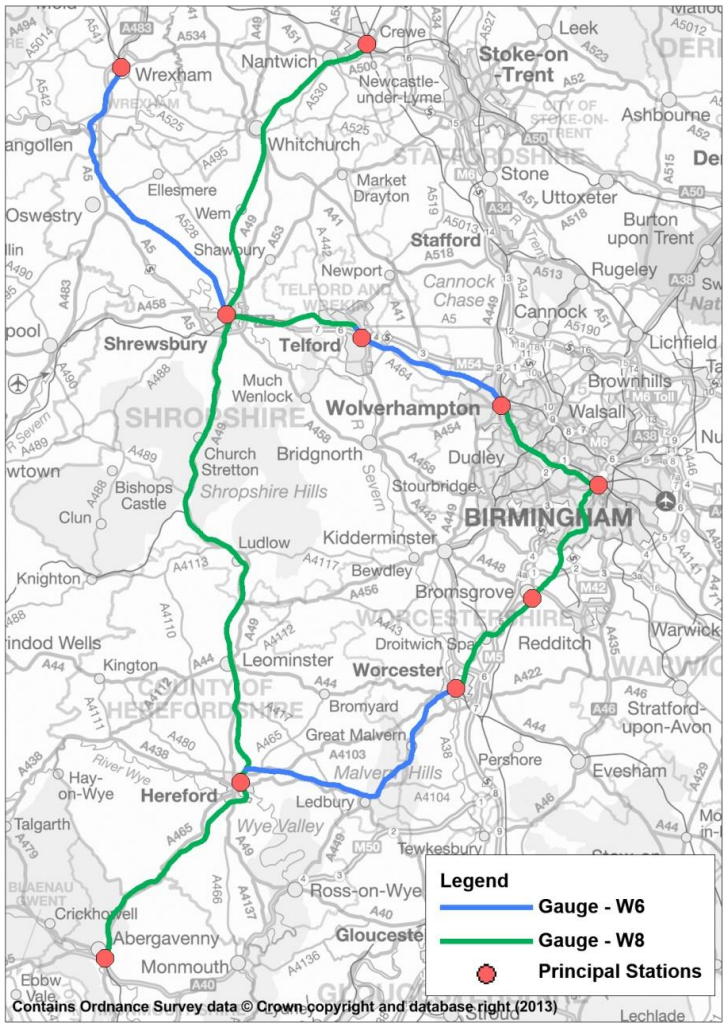
The loading gauge on a route can be a major constraint for rail freight, particularly intermodal (containerised) freight. A minimum gauge standard of W8 is typically required to accommodate freight traffic.

[11] Source: Office of Rail Regulation estimates of station usage (http://www.rail-reg.gov.uk/server/show/nav.1529)

**Table 4.12 Loading Gauge by Route**

| Route | Loading Gauge |
|---|---|
| **Marches Line** | |
| Abergavenny - Shrewsbury | W8 |
| Shrewsbury - Wrexham | W6 |
| **Shrewsbury to Crewe Route** | |
| Shrewsbury - Crewe | W8 |
| **Shrewsbury to Birmingham Route** | |
| Shrewsbury - Oakengates | W8 |
| Oakengates - Wolverhampton | W6 |
| Wolverhampton - Birmingham New Street | W8 |
| **Hereford to Birmingham Route** | |
| Hereford - Worcester Foregate Street | W6 |
| Worcester Foregate Street - Birmingham New Street | W8 |

**Figure 4.5 Loading Gauge by Route**



## 4.5. Rail Freight

Presented below is a summary of high level findings relating to rail freight on the principle routes investigated in this study, as obtained from Realtime Trains[12].

### 4.5.1. Hereford to Shrewsbury

Reviewing recent freight movements between Hereford and Shrewsbury has shown a relatively high level of rail freight demand. Though the number of services operating each day varies considerably, typically between 10-13 freight services operate each weekday on a frequency of one freight train approximately every 1-2 hours. The route is used principally for the movement of coal (Portbury Coal Terminal to Rugeley Power Station), steel (Margam) and automotives (Portbury Automotive Terminal).

### 4.5.2. Hereford to Stoke Works Junction

No freight services operate on this line. This is due to the gauge constraints provided by the tunnels at Colwall and Ledbury which effectively prevent freight traffic from using this route.

### 4.5.3. Shrewsbury to Birmingham

Investigations into freight movements show that approximately three freight trains run each working day between Shrewsbury and Wolverhampton, all of which carry coal. Between Wolverhampton and Birmingham typically 1-2 freight services operate on the line each working day. All the freight services observed operating were carrying steel and were travelling either to or from Wolverhampton Steel Terminal.

## 4.6. Newport-Shrewsbury Resignalling

It is important that this study factor in current planned improvement works in the Marches region. Under Control Period 5 (CP5) funding, Network Rail is currently developing plans for the resignalling of the Newport to Shrewsbury line[13], subject to funding being available. This major renewals scheme is forecast for commissioning in 2017 and will see modular signalling replacing the mechanical signalling currently controlled by 13 signal boxes (with signalling transferred to a Railway Operating Centre). Alongside resignalling, track layouts will be remodelled to allow bi-directional signalling over sections of 10 miles in length. Improvements to Abergavenny station will allow for a direct turn back facility whilst enhancements to Hereford station will allow full bi-directional accessibility to all platforms, with at least one platform also being improved to accommodate a 10 car Intercity Express (IEP) train. Upgrades to the existing automatic half barrier crossings at Wellington, Leominster and Ashford Bowdler will see the crossings converted to signalled full barrier crossings.

The works detailed here are designed to allow 100mph line speed running. This will be achieved through reducing the headway between services, particularly at key locations on the route, such as Shrewsbury and Hereford, where reduced headways will allow freight paths to be timetabled in around passenger services.

A timetable and capacity study undertaken by Network Rail in 2012 found that the proposed resignalling scheme could allow for improvements to the timetable for services operating on the line that would[14]:

- Enable an hourly service to be provided between North and South Wales in each direction (subject to specification);
- Enable an hourly service to be provided between Manchester and South Wales in each direction;
- Enable an hourly freight path to be provided in each direction;
- Enable an additional shuttle service between Abergavenny and Cardiff Central in each hour; and
- Enable journey time improvements to be achieved with some improved ‘headline timings’ for the business service between north and south Wales.

Whilst running additional passenger services is beneficial, allowing for more passenger trains alongside freight services could potentially have negative consequences on performance. This could be relieved through infrastructure improvements benefiting freight services, such as additional freight loops.

[12] www.realtimetrains.co.uk
[13] Wales Route: Summary Route Plan (Network Rail, Version 1.0, 2013)
[14] The full timetable benefits detailed could only be achieved if all the resignalling schemes being considered for the route (Newport-Shrewsbury, Shrewsbury-Chester and Chester-Holyhead) were implemented.

Network Rail's study noted that future possible upgrades to the route could include linespeed enhancements, allowing for reduced journey times and increased operating revenue. However, the business case needed to pursue this could not be developed in time to fit within the resignalling programme and therefore the resignalling scheme will allow for passive provision of future linespeed improvements. A further potential improvement would be signalling enhancement, with additional signals allowing for shorter block sections (and therefore shorter headways).

# 5. Passenger Demand Forecasting

This chapter presents estimates of future rail demand in the Marches region, taking into account changes in the following key factors:

- Population;
- Economic activity; and
- Rail fares.

The specific outcome of this work is a forecast of the potential unconstrained growth in rail passenger demand between the Marches region and Birmingham, and between various stations on the Marches line and Hereford. The outcome is an estimate of unconstrained future demand up to 2024, which is the end of Network Rail's CP6.

Forecasting the unconstrained demand allows us to assess where there are shortcomings in future rail capacity and thereby identify the 'outputs' which are required for the rail network in the Marches region to support the overall objectives of the LEP and the LTB and assist in delivering the growth agenda.

## 5.1. Methodology

The methodology adopted to forecast future passenger demand for this study has followed that set out in the Passenger Demand Forecasting Handbook (PDFH).

The currently adopted version of the handbook is 5.0. Hence the forecasting work undertaken in this technical note follows the principles and values defined in that version. The latest version, V5.1, has been published but has not been formally adopted. In order to future proof this forecasting work, we have also created a separate forecast using the principles and values defined in V5.1.

Exogenous demand growth is defined as growth in rail patronage resulting from sources beyond the control of the rail industry. This contrasts with the 'endogenous' impacts on demand of changes in the quality of the rail service, such as reduced journey times or increased service frequency. This study focuses on the exogenous growth effects on passenger demand.

For current purposes, rail fares are considered exogenous, with unregulated fares assumed to rise in line with regulated fares at a rate of zero percent ahead of Retail Price Inflation each year or "RPI+0". However, in consideration that regulated fares may increase, a sensitivity test has been run using a regulated fare increase of RPI+1. An increase in rail fares will serve to reduce rail demand.

The impact of exogenous growth was accounted for in this study by factoring passenger journeys by a calculated exogenous growth factor. The exogenous growth factor allowed for changes in:

- Population;
- Economic activity (based on GDP per capita and levels of employment); and
- Rail fares.

For the 2024 forecast year, the overall growth factor (or index, *I*) applied to base 2011 demand was calculated as follows[15]:

$$I = \left(\frac{GDP\ per\ capita\ [new]}{GDP\ per\ capita\ [base]}\right)^{g} * \left(\frac{Population\ [new]}{Population\ [base]}\right)^{p} * Rail\ fare\ change^{f}$$

Within the formula, 'f', 'g' and 'p' are elasticities which are set out in the relevant version of PDFH.

[15] It should be noted that both GDP per capita and job growth are considered in the calculation but this depends on the version of PDFH used and the assumed ticket type.

The PDFH approach does allow for a number of other changes to be considered, including the future change in fuel costs, levels of car ownership and changes in the costs of competing modes such as bus and coach. However, in the absence of robust evidence regarding the nature or magnitude of these changes in the future, the assessment made at this time has been limited to the aforementioned changes in population, economic activity and rail fares.

A summary of the approach used for the two different versions of PDFH is set out in Table 5.1

To avoid duplication of work, where possible we used evidence presented in other studies and by the Councils. The specific data sources are summarised in Table 5.1.

**Table 5.1 Summary of Methodology**

| PDFH Version | | V5.0 | | V5.1 | |
|---|---|---|---|---|---|
| **Ticket Type** | | **Season Tickets** | **Non-Season Tickets** | **Season Tickets** | **Non-Season Tickets** |
| Assessment of Change in Population | Approach | A factor is created based on the forecast change in population to 2024 within 5km of each origin station, relative to the future change in population to 2024 for the wider region (calculated using Tempro). For example, if the current population is 10,000 and the future population is calculated to be 12,000, the factor for local growth would be calculated to be 20%. However, it is necessary to consider local growth against wider region growth, so if Tempro suggests a figure of 10% growth for the wider area, the factor would be 1.09, or 9% | A factor is created based on the forecast change in population to 2024 within 5km of each origin station. For example, if the current population is 10,000 and the future population is forecast to be 12,000, the factor would be calculated to be 1.20 (representing 20% growth in population) | Same as season tickets for V5.0 | Same as non-season tickets for V5.0 |
| | Elasticity | 1.0 for all, regardless of distance from destination | Same as season tickets for V5.0 | Same as season tickets for V5.0 | Same as season tickets for V5.0 |
| | Data Sources | Current populations within 5km of each station have been informed either by Network Rail's Market Study or by the 2011 Census<br>Future populations have been informed by various planning documents, but principally:<br>Shropshire Local Development Framework: Adopted Core Strategy<br>Herefordshire Local Plan Core Strategy<br>Shaping Places Local Plan: Strategy & Options (Telford & Wrekin) - Consultation Document<br>Abergavenny Local Plan | Same as season tickets for V5.0 | Same as season tickets for V5.0 | Same as season tickets for V5.0 |
| Assessment of Change in Employment/ Economy | Approach | For stations over 20 miles from the destination, a factor is created based on future forecast GDP per capita (2024) relative to base (2011) GDP per capita<br>For stations under 20 miles from the destination, a factor is created based on future forecast jobs at the destination (2024) relative to the current number of jobs at the destination (2011) | For all stations, a factor is created based on future forecast GDP per capita (2024) relative to base (2011) GDP per capita | For all stations, a factor is created based on future forecast jobs at the destination (2024) relative to the current number of jobs at the destination (2011) | Same as non-season tickets for V5.0 |
| | Elasticity | Stations over 20 miles from destination: 1.5<br>Stations under 20 miles from destination: 1.0 | Stations over 20 miles from destination: 1.1<br>Stations under 20 miles from destination: 0.85 | All stations: 1.3 | All stations: 1.2 |
| | Data Sources | GDP per capita has been based on data from the Office of Budget Responsibility (OBR) and Office for National Statistics (ONS) population forecasts, extrapolating where necessary<br>Current and future numbers of jobs have been extracted from various documents, but principally:<br>Birmingham Big City Plan (2011)<br>Birmingham Strategy for Growth (2013)<br>Black Country Draft Strategic Economic Plan (2013)<br>Marches Draft Strategic Economic Plan (2013) | GDP per capita has been based on data from the OBR and ONS, extrapolating where necessary | Current and future numbers of jobs have been extracted from various documents, but principally:<br>Birmingham Big City Plan (2011)<br>Birmingham Strategy for Growth (2013)<br>Black Country Draft Strategic Economic Plan (2013)<br>Marches Draft Strategic Economic Plan (2013) | GDP per capita has been based on data from the OBR and ONS, extrapolating where necessary |

## 5.2. Baseline Demand

Baseline levels of demand have been ascertained from two sources:

- For travel to Birmingham, data was obtained from Network Rail's Long Term Planning Process: Regional Urban Market Study (2013);
- For travel to Hereford from Leominster, Ludlow, Craven Arms, Church Stretton and Shrewsbury, data was obtained from the Rotherwas Rail Study completed by Jacobs and Office for Rail Regulation (ORR) annual entries and exits for 2011;
- For travel to Hereford from Abergavenny, data was obtained from ATW. This data was subjected to a confidentiality agreement and as such figures for current and future demand cannot be presented – only the forecast growth.

The baseline data, all in a 2011 base, is summarised in Table 5.2.

**Table 5.2 Baseline Demand (One Way)[16]**

| Destination Station | Origin Station | Annual Base Travel (2011) | Notes |
|---|---|---|---|
| Birmingham | Hereford | 84,000 | Based on April 2011 to March 2012 |
| | Ledbury | 28,000 | |
| | Colwall | 5,000 | |
| | Shrewsbury | 201,000 | |
| | Wellington | 138,000 | |
| | Oakengates | 10,000 | |
| | Telford Central | 271,000 | |
| | Shifnal | 35,000 | |
| | Cosford | 12,000 | |
| | Albrighton | 37,000 | |
| | Codsall | 53,000 | |
| Hereford | Leominster | 85,433 | Source: Rotherwas Rail High Level Business Case Study Final Report for Herefordshire Council (Jacobs, 2012) |
| | Ludlow | 54,072 | |
| | Craven Arms | 5,407 | |
| | Church Stretton | 2,163 | |
| | Shrewsbury | 8,651 | |

In order to calculate the future level of demand for travel, it was first necessary to consider the split of the journeys by journey type. In the absence of any more robust and locally applicable data, PDFH has been used to estimate the split of the journeys in Table 2 into season tickets and non-season tickets. Table 5.3 has been extracted from the PDFH handbook and shows that for journeys outside the south east, which are between 20 and 100 miles in length, it would be expected that 24.2% of journeys would be made using a season ticket.

[16] Actual flows for Abergavenny to Hereford cannot be presented due to restrictions on data usage

**Table 5.3 Mapping Ticket Type to Journey Purpose: Outside South East, 20-100 Miles**

| Journey Purpose | Anytime | Off-Peak | Season | Total |
|---|---|---|---|---|
| Commuting | 9.7% | 4.1% | 22.4% | **36.2%** |
| Business | 5.0% | 6.7% | 0.9% | **12.6%** |
| Leisure | 7.4% | 42.9% | 0.9% | **51.2%** |
| **Total** | **22.1%** | **53.7%** | **24.2%** | **100.0%** |

Table 5.4 shows the assumed split of journeys into season and non-season tickets, based on the values presented in Table 5.3.

**Table 5.4 Assumed Ticket Type Split[17]**

| Destination Station | Origin Station | Annual Base Travel (2011) | Seasons | Non-Seasons |
|---|---|---|---|---|
| Birmingham | Hereford | 84,000 | 20,328 | 63,672 |
| | Ledbury | 28,000 | 6,776 | 21,224 |
| | Colwall | 5,000 | 1,210 | 3,790 |
| | Shrewsbury | 201,000 | 48,642 | 152,358 |
| | Wellington | 138,000 | 33,396 | 104,604 |
| | Oakengates | 10,000 | 2,420 | 7,580 |
| | Telford Central | 271,000 | 65,582 | 205,418 |
| | Shifnal | 35,000 | 8,470 | 26,530 |
| | Cosford | 12,000 | 2,904 | 9,096 |
| | Albrighton | 37,000 | 8,954 | 28,046 |
| | Codsall | 53,000 | 12,826 | 40,174 |
| Hereford | Leominster | 85,433 | 20,675 | 64,758 |
| | Ludlow | 54,072 | 13,085 | 40,986 |
| | Craven Arms | 5,407 | 1,309 | 4,099 |
| | Church Stretton | 2,163 | 523 | 1,639 |
| | Shrewsbury | 8,651 | 2,094 | 6,558 |

## 5.3. Population and Housing

Both PDFH versions treat the change in population using the same methodology.

Base population within 5km of each origin station has been extracted from two sources:

- For the railway stations on the routes between Hereford, Shrewsbury and Birmingham, data was obtained from Network Rail's Long Term Planning Process: Regional Urban Market Study (2013); and
- For the railway stations on the Marches line between Abergavenny and Shrewsbury, base population has been extracted the 2011 Census, based on output areas.

Future changes in population have been informed by a number of sources:

[17] Actual flows for Abergavenny to Hereford cannot be presented due to restrictions on data usage

- Population projections for Telford and Wrekin Council have been sourced from the Telford & Wrekin Population Estimates & Projections 2011 publication;
- For Herefordshire and Shropshire, population projections have been calculated based on housing development data. For Herefordshire, housing development data has been obtained from the Local Plan Core Strategy 2011-2031(2013) and the Strategic Housing Land Availability Assessment (2012). For Shropshire, housing development data has been obtained from the Site Allocations and Management of Development Plan (2012). Housing projections have been converted to population projections using population and household data from the 2011 Census;
- For Abergavenny, growth has been identified from the Local Plan; and
- General population forecasts for Herefordshire , Shropshire and Telford and Wrekin have been sourced from TEMPRO.

The results of the population assessment are set out in Table A.1 and Table A.2 for season and non-season tickets respectively. The tables show the PDFH elasticities that have been used to calculate a metric.

## 5.4. Economic Activity

As earlier shown in Table 5.1, PDFH Versions 5.0 and 5.1 take a different approach to considering the change in economic activity. Whilst both versions use a change in GDP per capita for the non-season ticket travel, the approach to season ticket travel in V5.0 is to use the change in GDP per capita for journeys over 20 miles, but the change in the number of jobs at the destination for journeys under 20 miles. In contrast, V5.1 uses the change in the number of jobs at the destination for all journeys, regardless of distance.

GDP information has been sourced from the Office of Budget Responsibility (OBR) website. The OBR's forecast for GDP extends to 2018 and hence to determine a value for 2024, it has been necessary to use some form of extrapolation. Specifically, two approaches to extrapolation have been used, one which continues growth at the same rate as the period for which the forecast has been produced. The second, more conservative approach, upon which the figures in this technical note have been produced, is to assume that year on year, growth continues at the same rate as it is forecast to between 2017 and 2018 (i.e. the end of OBR's forecast period). To convert the extrapolated GDP forecasts to GDP per capita, it has been necessary to use forecasts of population published by the Office of National Statistics (ONS).

Forecast employment growth for Birmingham City Centre has been sourced from the Birmingham Big City Plan (2011) and Strategy for Growth (2013), whilst growth for the Black Country has been sourced from the draft Black Country Strategic Economic Plan (December 2013). Employment growth in Herefordshire is informed by the Marches region's Strategic Economic Plan (SEP), as published in 2013. With the exception of Hereford, figures from those same sources were used to estimate the current number of jobs. Base employment data for Hereford has been obtained from the NOMIS Business Register and Employment Survey 2011 and includes the following ward areas:

- Aylestone;
- Belmont;
- Central;
- St Martins and Hinton;
- St Nicholas;
- Three Elms;
- Tupsley;
- Burghill, Holmer and Lyde;
- Credenhill;
- Hagley;
- Hollington;
- Backbury;
- Stoney Street; and
- Sutton Walls.

The results of the assessment are set out in Table B.1 to Table B.4.

## 5.5. Results

The final component of the calculation involved an assessment of the impact of a change in rail fares in the future. This study has considered two different scenarios regarding a future change in rail fares:

- "RPI+0%" – assumes that fares move in line with RPI; and
- "RPI+1%" – assumes that fares move at 1% above RPI.

The results of the assessment using V5.0 and V5.1 of PDFH are set out in Table 5.6 and Table 5.7 respectively, based on RPI+0%. The results based on RPI+1% are set out in Appendix C. Figure 5.1 to Figure 5.5 present the results graphically.

Our assessment of the potential for rail passenger traffic growth in the Marches region has shown that growth of the order of 40-50% is possible by the end of CP6 (2024) (based on fares moving in line with RPI). The figures have been calculated based on unconstrained growth, meaning constraints on growth such as on-board capacity have not been considered. This finding applies both to the routes into Birmingham and the stations on the Marches line for travel into Hereford.

As well as the growth shown in this assessment, it is expected that trips internal to the Marches region and not considered in this study (for example, Shrewsbury to Telford) will also increase relative to the new jobs and housing created in these locations.

Analysis of the results shown in Appendix C, which have been based on fares rising at RPI+1, confirms that growth in demand is very sensitive to future changes in rail fares, and hence it is clear that Government Policy regarding fare changes may serve to have a significant impact on the level of growth which does materialise in the Marches region. As such, we can determine a range of potential growth for the routes analysed, as shown in Table 5.5below.

**Table 5.5 Summary of Rail Growth Potential in the Marches by the end of CP6 (2024)**

| Route | Low Growth (Assuming Fares grow RPI+1%) | High Growth (Assuming Fares grow RPI+0%) |
|---|---|---|
| Shrewsbury to Birmingham | 30% | 46% |
| Hereford to Birmingham | 38% | 55% |
| Shrewsbury to Hereford | 32% | 50% |

As previously noted, the potential growth in rail passenger demand identified in this study is an unconstrained forecast, meaning the results take no account of the available capacity and level of service on the routes. It is apparent therefore form the analysis completed as part of Technical Note 1, that additional passenger capacity (and associated services, such as car park availability) will be required to realise the levels of growth forecast.

The forecast demand results calculated in this study are in line with emerging industry forecasts for similar routes in the draft Welsh Route Study (2014)[18]. This indicates that the methodology applied in this study follows industry approved methods and that the potential growth projections calculated are realistic.

[18] Due to data confidentiality figures from the draft Welsh Route Study (2014) cannot be reproduced in this report.

**Table 5.6 PDFH 5.0 Summary with RPI+0% (rail passengers rounded to nearest 100)**

| Destination Station | Origin Station | 2011 Base: Seasons | 2011 Base: Non-Seasons | Total 2011 Base rail travel to Birmingham and Hereford | 2024 Forecast: Seasons | % Change | 2024 Forecast: Non-Seasons | % Change | Total 2011 Base rail travel to Birmingham and Hereford | % Change |
|---|---|---|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 20,300 | 63,700 | 84,000 | 32,800 | 62% | 100,300 | 57% | 133,200 | 59% |
| | Ledbury | 6,800 | 21,200 | 28,000 | 10,100 | 49% | 31,000 | 46% | 41,100 | 47% |
| | Colwall | 1,200 | 3,800 | 5,000 | 1,800 | 50% | 4,900 | 29% | 6,700 | 34% |
| | **Hereford Line Sub-Total** | **28,300** | **88,700** | **117,000** | **44,700** | **58%** | **136,200** | **54%** | **181,000** | **55%** |
| | Shrewsbury | 48,600 | 152,400 | 201,000 | 72,700 | 50% | 231,500 | 52% | 304,200 | 51% |
| | Wellington | 33,400 | 104,600 | 138,000 | 46,600 | 40% | 154,900 | 48% | 201,400 | 46% |
| | Oakengates | 2,400 | 7,600 | 10,000 | 3,400 | 42% | 11,200 | 47% | 14,600 | 46% |
| | Telford Central | 65,600 | 205,400 | 271,000 | 91,500 | 39% | 304,100 | 48% | 395,600 | 46% |
| | Shifnal | 8,500 | 26,500 | 35,000 | 11,900 | 40% | 37,800 | 43% | 49,600 | 42% |
| | Cosford | 2,900 | 9,100 | 12,000 | 4,500 | 55% | 13,600 | 49% | 18,100 | 51% |
| | Albrighton | 9,000 | 28,000 | 37,000 | 13,800 | 53% | 37,200 | 33% | 51,000 | 38% |
| | Codsall | 12,800 | 40,200 | 53,000 | 16,000 | 25% | 51,300 | 28% | 67,200 | 27% |
| | **Shrewsbury Line Sub-Total** | **183,200** | **573,800** | **757,000** | **260,400** | **42%** | **841,600** | **47%** | **1,101,700** | **46%** |
| | **Birmingham Destination Sub-Total** | **211,500** | **662,500** | **874,000** | **305,100** | **44%** | **977,800** | **48%** | **1,282,700** | **47%** |
| Hereford | Leominster | 20,700 | 64,800 | 85,400 | 32,300 | 56% | 99,100 | 53% | 131,400 | 54% |
| | Ludlow | 13100 | 41000 | 54,100 | 20,200 | 54% | 57,800 | 41% | 78,000 | 44% |
| | Craven Arms | 1300 | 4100 | 5,400 | 1,900 | 46% | 6,200 | 51% | 8,100 | 50% |
| | Church Stretton | 500 | 1600 | 2,200 | 800 | 60% | 2,300 | 44% | 3,100 | 41% |
| | Shrewsbury | 2100 | 6600 | 8,700 | 3,000 | 43% | 9,500 | 44% | 12,400 | 43% |
| | Abergavenny | - | - | - | - | 43% | - | 38% | - | 39% |
| | **Hereford Destination Sub-Total (exc. Abergavenny)** | **37,700** | **118,100** | **155,800** | **58,200** | **54%** | **174,900** | **48%** | **233,000** | **50%** |

**Table 5.7 PDFH 5.1 Summary with RPI+0% (rail passengers rounded to nearest 100)**

| Destination Station | Origin Station | 2011 Base: Seasons | 2011 Base: Non-Seasons | Total 2011 Base rail travel to Birmingham and Hereford | 2024 Forecast: Seasons | % Change | 2024 Forecast: Non-Seasons | % Change | Total 2011 Base rail travel to Birmingham and Hereford | % Change |
|---|---|---|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 20,300 | 63,700 | 84,000 | 28,600 | 41% | 102,600 | 61% | 131,100 | 56% |
| | Ledbury | 6,800 | 21,200 | 28,000 | 8,800 | 29% | 31,600 | 49% | 40,500 | 45% |
| | Colwall | 1,200 | 3,800 | 5,000 | 1,600 | 33% | 5,000 | 32% | 6,600 | 32% |
| | **Hereford Line Sub-Total** | **28,300** | **88,700** | **117,000** | **39,000** | **38%** | **139,200** | **57%** | **178,200** | **52%** |
| | Shrewsbury | 48,600 | 152,400 | 201,000 | 64,500 | 33% | 236,700 | 55% | 301,200 | 50% |
| | Wellington | 33,400 | 104,600 | 138,000 | 41,300 | 24% | 158,300 | 51% | 199,600 | 45% |
| | Oakengates | 2,400 | 7,600 | 10,000 | 3,000 | 25% | 11,500 | 51% | 14,500 | 45% |
| | Telford Central | 65,600 | 205,400 | 271,000 | 81,100 | 24% | 310,900 | 51% | 392,000 | 45% |
| | Shifnal | 8,500 | 26,500 | 35,000 | 10,500 | 24% | 38,600 | 46% | 49,100 | 40% |
| | Cosford | 2,900 | 9,100 | 12,000 | 4,000 | 38% | 13,900 | 53% | 17,900 | 49% |
| | Albrighton | 9,000 | 28,000 | 37,000 | 12,300 | 37% | 38,000 | 36% | 50,300 | 36% |
| | Codsall | 12,800 | 40,200 | 53,000 | 16,700 | 30% | 55,400 | 38% | 72,100 | 36% |
| | **Shrewsbury Line Sub-Total** | **183,200** | **573,800** | **757,000** | **233,400** | **27%** | **863,300** | **50%** | **1,096,700** | **45%** |
| | **Birmingham Destination Sub-Total** | **211,500** | **662,500** | **874,000** | **272,400** | **29%** | **1,002,500** | **51%** | **1,274,900** | **46%** |
| Hereford | Leominster | 20,700 | 64,800 | 85,400 | 35,000 | 58% | 107,000 | 65% | 142,100 | 64% |
| | Ludlow | 13,100 | 41,000 | 54,100 | 20,700 | 47% | 59,100 | 44% | 79,700 | 45% |
| | Craven Arms | 1,300 | 4,100 | 5,400 | 2,000 | 38% | 6,300 | 54% | 8,300 | 50% |
| | Church Stretton | 500 | 1,600 | 2,200 | 800 | 60% | 2,400 | 50% | 3,200 | 41% |
| | Shrewsbury | 2100 | 6,600 | 8,700 | 3,000 | 33% | 9,700 | 47% | 12,700 | 44% |
| | Abergavenny | - | - | - | - | 46% | - | 41% | - | 42% |
| | **Hereford Destination Sub-Total (exc. Abergavenny)** | **37,700** | **118,100** | **155,800** | **61,500** | **63%** | **184,500** | **56%** | **246,000** | **58%** |

**Figure 5.1 Change in Rail Trips to Birmingham (using PDFH 5.0 and RPI+0)**

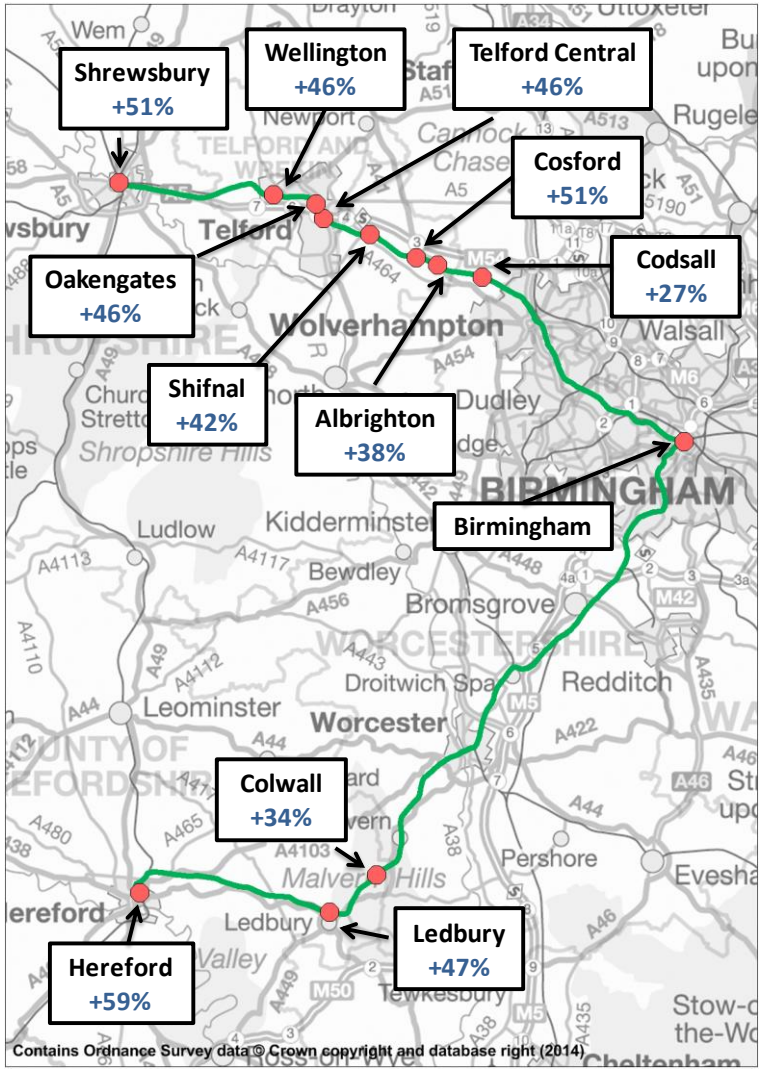



**Figure 5.2 Change in Rail Trips to Birmingham on the Hereford Line (using PDFH 5.0 and RPI+0%)**

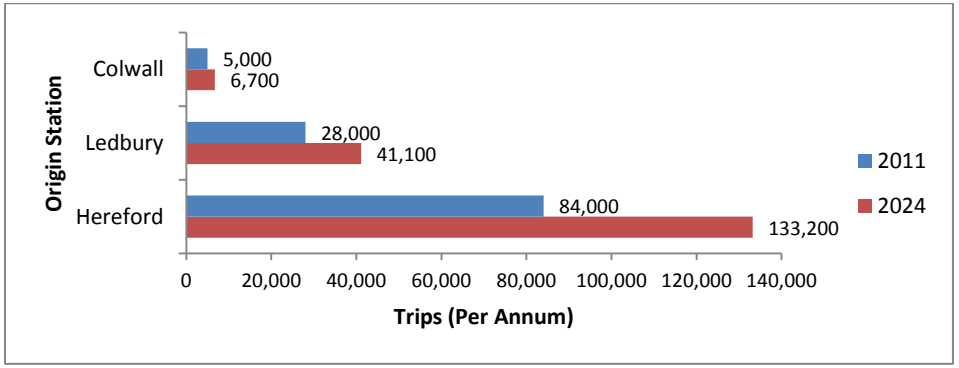



**Figure 5.3 Change in Rail Trips to Birmingham on the Shrewsbury Line (using PDFH 5.0 and RPI+0%)**

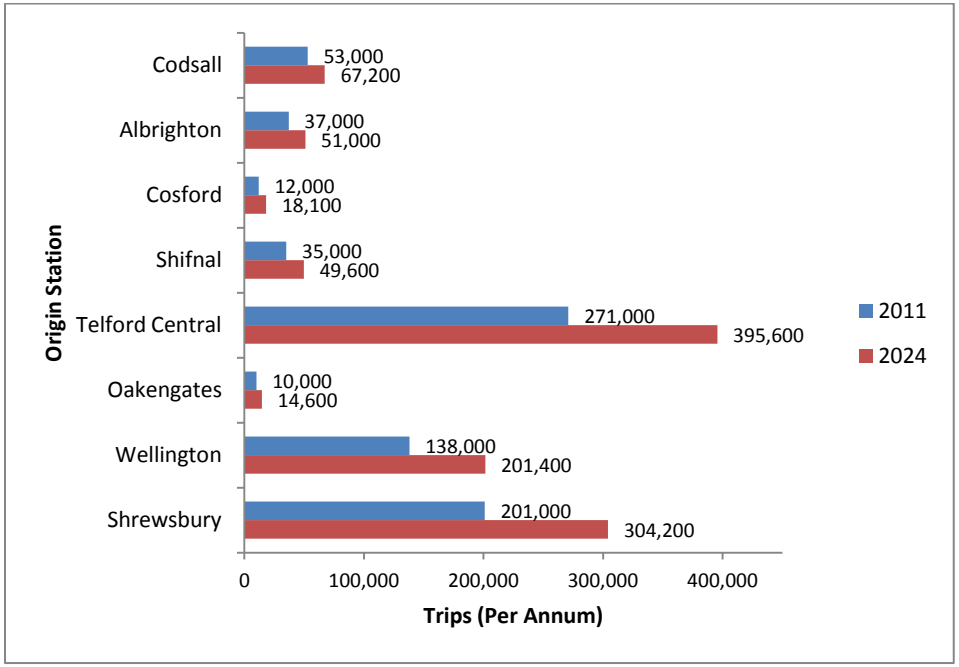


**Figure 5.4 Change in Rail Trips to Hereford (using PDFH 5.0 and RPI+0)**

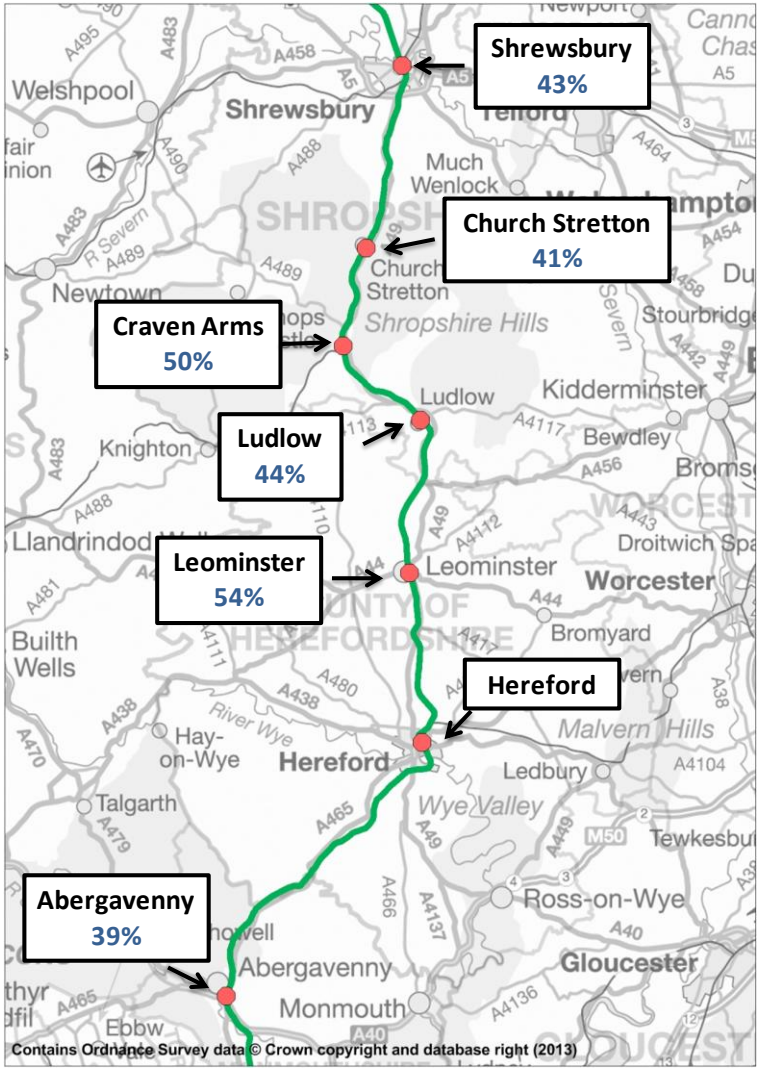
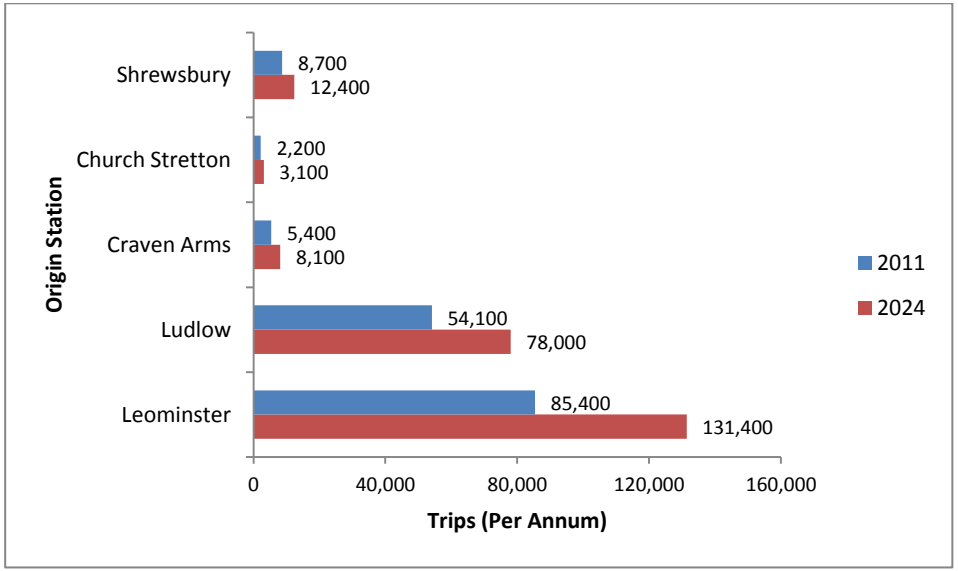



**Figure 5.5 Change in Rail Trips to Hereford (using PDFH 5.0 and RPI+0%)**



# 6. Findings

## 6.1. Conditional Outputs and Potential Solutions

The previous chapters of this report have identified:

- The current service provision on routes in the Marches region;
- Infrastructure constraints on routes in the area; and
- The potential for passenger growth in the area.

Taking this into account, this chapter identifies the emerging conditional outputs that need to be addressed to deliver the levels of passenger demand forecast and details a number of potential solutions to overcome the outputs. This is presented, by route, in the following tables:

- Table 6.1 – Hereford to Birmingham Route;
- Table 6.2 – Marches line; and
- Table 6.3 – Shrewsbury to Birmingham Route.

Following this, a high level assessment of the potential solutions is presented.

**Table 6.1 Hereford to Birmingham Route**

| | Consideration | Comments |
|---|---|---|
| | **Expected Increase in Demand** | Hereford to Birmingham demand is forecast to increase 59% by 2024 when assuming fares rise at RPI+0, or 41% assuming RPI+1 (using PDFH 5.0 methodology). Demand at stations along the route is also expected to rise significantly, with 47% growth from Ledbury to Birmingham and 34% growth from Colwall, both based on RPI+0 (using PDFH 5.0 methodology). |
| | **Overview of issues** | Applying the aforementioned levels of growth to existing train loadings (and formations) shows that a number of the LM services would become overcrowded. This means that either longer or more frequent trains will be required in the future, if this level of demand is to be catered for.<br>No assessment of crowding on the FGW trains towards London Paddington has been possible. The recent re-doubling of much of the Cotswold Line may however mean that many more trains can be run between Hereford/Worcester and London, via Oxford, if the business case is sufficient. |
| | **Conditional Output** | The following conditional output has emerged from this study:<br>• The requirement for additional passenger capacity in the future.<br><br>This finding supports the conditional outputs noted in Network Rail's Regional Urban Market Study (2013). In addition to the need for extra capacity, that study also identified the following conditional outputs:<br>• Increasing the frequency of services between Worcester and Birmingham;<br>• Reduced journey times between Hereford and Worcester; and<br>• Additional car parking capacity to accommodate rail demand. |
| **Potential Solutions** | **Rolling Stock** | Lengthening of services to provide more capacity is a clear option for the route but selective door opening would be required at some of the stations with shorter platform lengths, such as Ledbury and Colwall.<br><br>The majority of services on the route are operated by Class 170 Turbostar units. Theoretically, upgrading the rolling stock (perhaps to Class 172 units, as operated by LM on the Snow Hill Lines) would allow for quicker acceleration and deceleration on the route, which may permit reduced journey times. However, this option is unlikely to be viable in the short to medium term as this newer rolling stock is currently fully utilised elsewhere and the longer term viability of procuring new diesel fleets appears questionable given the large number of electrification schemes which are being rolled out across the UK. With the increase in electrification elsewhere, there may however be some considerable opportunities to cascade comparable rolling stock to that currently operated, to supplement the existing Turbostar fleets and potentially provide longer trains. |
| | **Extra Services** | The service between Hereford and Birmingham New Street currently operates hourly. The analysis of crowding showed that to enable the capacity of the route to meet expected passenger demand in the future, trains will either need to be lengthened or run more frequently. Further discussion of the impact on the single line section on potential service upgrades is provided in the next row of the table. It should also be noted that in the near future, additional services may be operated between Worcester and Birmingham New Street, potentially upgrading this service to half hourly (in line with Network Rail's conditional output to increase frequency between Worcester and Birmingham). Should service provision between Worcester and Birmingham be increased, there may be considerable benefit for stations through to Hereford. Additionally, there could potentially be scope for some of the additional services to be extended to Hereford (subject to business case, unit allocations, etc.). |
| | **Rail Infrastructure** | The single track section between (broadly) Hereford and Great Malvern provides a significant constraint to capacity on the route. At the current time, it is possible to operate four tph through that section. Assuming no requirement for freight to operate on the route, this would mean that in the hours when FGW does not operate a service between Hereford and Worcester, there is spare capacity available and hence the frequency of the LM service could be increased. To provide capacity for 3tph along the route, per direction, extra infrastructure is required, as shown by an initial Atkins high level assessment of capacity. This identified the need to provide approximately 2½ miles of double track between Colwall Tunnel and Ledbury Tunnel and approximately 6½ miles of double track between Ledbury Station and Shelwick junction. This would enable 3tph (per direction) to operate, or 6tph in total. |

**Table 6.2 Marches line**

| | Consideration | Comments |
|---|---|---|
| | **Expected Increase in Demand** | No assessment of demand into Shrewsbury has been possible. However an assessment of demand from stations on the Marches line into Hereford shows that considerable growth is forecast, ranging from 41% from Church Stretton into Hereford, to 64% from Leominster into Hereford, assuming fares rise at RPI+0 (using PDFH 5.0 methodology). |
| | **Overview of issues** | No information on train loadings on the Marches line is available for this study. However, based on anecdotal evidence regarding overcrowding of peak time services on the route, particularly in the Hereford and Shrewsbury areas, extra capacity will be needed in the future. Anecdotal evidence provided by Herefordshire Council and ATW, highlights that the route is well used by school children leading to acute crowding issues in the periods around school & College opening and closing times. This suggests that local movements within the Marches region may be a major contributor to the observed overcrowding on ATW's longer distance services. |
| | **Conditional Output** | The following conditional output has emerged from this study:<br>• The requirement for additional future passenger capacity into both Hereford and Shrewsbury on the Marches line. |
| **Potential Solutions** | **Rolling Stock** | Whilst lengthening of existing services would alleviate current and future overcrowding concerns on the Marches line, it is noted that the ATW services are long distance services and overcrowding on short sections of the route may not justify the running of longer services over the entire route. Hence, extra short distance services may provide a more feasible option.<br>The majority of services on the route are operated by Class 175 Coradia units. Theoretically, upgrading the rolling stock to a newer DMU would allow for quicker acceleration and deceleration on the route. As noted earlier for the Hereford to Birmingham route, this option of introducing new diesel rolling stock is unlikely to be viable, but cascades of other units as a result of electrification elsewhere may provide the opportunity to lengthen existing services or provide additional ones. |
| | **Extra Services** | The level of crowding experienced on the Marches line may not be (although liaison with ATW in the first instance is encouraged) sufficient to justify longer distance formations on ATW's existing long distance services. To cater specifically for the overcrowded sections on the Marches line (for example, into and out of Hereford and Shrewsbury in the peak periods), there may be demand for new, shorter distance services to be operated, perhaps between Hereford and Shrewsbury. This shuttle service could cater for local trips and reduce overcrowding on ATW's longer distance services. A linked benefit could be that ATW's longer distance services could operate semi-fast along the Marches line, giving journey time benefits for long distance passengers. |
| | **Rail Infrastructure** | The route is double track throughout and hence infrastructure is not considered to be a major constraint at this time. If additional services are to be introduced on part of the route, consideration will need to be given to turnback capacity at the proposed route ends.<br>The planned renewal of signalling along the Marches line will, as a by-product, provide a significant opportunity to review the timetabling of passenger and freight services along the route, which has not been possible to date due to the current semaphore signalling and absolute block sections. |

**Table 6.3 Shrewsbury to Birmingham Line**

| | Consideration | Comments |
|---|---|---|
| | **Expected Increase in Demand** | Shrewsbury to Birmingham demand is forecast to increase 51% by 2024 when assuming fares rise at RPI+0, or 35% assuming RPI+1 (using PDFH 5.0 methodology). Demand at stations along the route is expected to rise at different rates, with the principle stations of Telford Central and Wellington forecast to have a 46% increase in demand when assuming fares rise at RPI+0, or 30% assuming RPI+1. |
| | **Overview of issues** | Currently, some services are operating with high passenger loads, though none operate in excess of capacity. However, applying the forecast growth to current passenger levels results in some services (particularly in the peak) becoming over crowded. This shortfall in capacity will place a limitation on demand growth if it is not addressed.<br>There is a need to address the 20/40 minute wait time for services between Shrewsbury and Birmingham to allow for a regular service. |
| | **Conditional Output** | The following conditional outputs have emerged from this study:<br>• The need to provide an even service pattern;<br>• The requirement for additional passenger capacity in the future; and<br>• The need for improved journey times from Shrewsbury and Telford to Wolverhampton and Birmingham.<br>These findings support the conditional outputs noted in Network Rail's Regional Urban Market Study (2013). |
| **Potential Solutions** | **Rolling Stock** | Theoretically, upgrading the rolling stock would allow for quicker acceleration and deceleration on the route. However, as previously discussed, this option is unlikely to be viable as the rolling stock is not available currently and is unlikely to become available in the short-medium term future given the high demand for diesel rolling stock and the unlikely scenario of new diesel rolling stock being made available.<br>Lengthening of services to provide more capacity is an option, however selective door opening would have to be employed at stations with shorter platform lengths, such as Bilbrook. |
| | **Extra Services** | High level analysis suggests that demand will not be great enough to warrant an additional service per hour throughout the day, however additional peak hour services may be necessary to accommodate the forecast growth.<br>Revision of the timetable to introduce a regular interval service will improve passenger satisfaction and raise demand by reducing the generalised journey time for the route. |
| | **Rail Infrastructure** | The current levels of service and passenger usage means that at present there is not a strong business case to upgrade line speeds along the route. The case for electrification is similarly complicated by the need to consider how this will impact upon the services which operate through to Wales.<br>However, in the future, if passenger growth does start to achieve the levels forecast in Chapter 5, the business case for both line speed improvements and electrification could change. Based upon our forecasts it is likely to be the end of CP6 / start of CP7 when these schemes start to become viable. |

## 6.2. Option Assessment

A high level assessment of each of the potential solutions identified in the previous section has been undertaken. This analysis involves a multi-criteria assessment of each of the potential solutions to identify those which perform best and should be taken forward for a detailed assessment. The criteria used in this assessment is presented in Table D.1, and includes:

- The alignment of the proposal with the region's strategic objectives;
- The likely BCR of the proposal;
- The deliverability and operation feasibility of the proposal; and
- The likely fundability of the proposal.

An initial high level prioritised list of schemes based on this analysis is shown in Table 6.4 below, with a more detailed table of results shown in Table D.2.

**Table 6.4 Scheme Prioritisation List**

| Rank | Scheme | Line Affected |
|---|---|---|
| 1 | Double track Shelwick Junction to Great Malvern | Hereford to Birmingham |
| 2 | Additional service on the Marches line | Marches |
| 3 | Re-time timetable on the Marches line | Marches |
| 4 | Regular frequency on Shrewsbury-Birmingham line | Shrewsbury to Birmingham |
| 5 | Train lengthening on Shrewsbury-Birmingham line | Shrewsbury to Birmingham |
| 6 | 3 TPH on Shrewsbury-Birmingham line | Shrewsbury to Birmingham |
| 7 | Line speed improvements on Shrewsbury-Birmingham line | Shrewsbury to Birmingham |
| 8 | Shrewsbury Parkway station | Shrewsbury to Birmingham |
| 9 | Electrification on Shrewsbury-Birmingham line | Shrewsbury to Birmingham |
| 10 | Ironbridge Gorge station | Potentially Shrewsbury to Birmingham |
| 11 | New local service Leominster to Rotherwas via Hereford | Hereford to Newport |
| 12 | New local service Leominster to Holme Lacy via Hereford | Hereford to Newport |
| 13 | Wellington to Stafford line | Shrewsbury to Birmingham |

Based on this prioritised list, a series of preferred interventions on each route has been identified for recommendation, as detailed in the following section. The remaining lower ranked schemes have been discussed further in Section 6.4.

## 6.3. Recommendations

Based on the findings of this study and the scheme prioritisation list presented above, a number of preferred interventions have been determined by the study team, as detailed below.

**Hereford to Birmingham Route**

It is probable that the single track sections of route between Hereford and Worcester, particularly that between Hereford and Great Malvern, will become a major obstacle to increasing capacity. Therefore, it is recommended that a study is undertaken of this section, to understand how it can best be used in the future, and what infrastructure may be required to facilitate this – in particular double tracking the route from Shelwick Junction to Great Malvern. This study should include liaison with the TOCs who currently use the route. This proposal was ranked highest in the prioritised list of schemes.

**Marches Line**

The most favourable intervention on the Marches line was the option operate an additional 'local' service over the route, thus alleviating some of the overcrowding concerns noted and to provide capacity for the potential passenger growth identified earlier in this study. Liaison with ATW is encouraged to determine whether there is scope for additional trains to be operated in the future to cater for local journeys.

**Shrewsbury to Birmingham Route**

Based on the prioritised list of schemes, we recommend that in the short term, investigations are undertaken with Network Rail/LM and ATW to examine the possibility of getting a 30 minute interval regular service along the Shrewsbury to Birmingham route. Furthermore, options for lengthening some peak period services should be explored to provide additional capacity along the route.

In the medium to long term, we recommend that the potential for providing three trains per hour (at a 20 minute interval) between Shrewsbury and Birmingham is examined, in particular, ascertaining if the electrification of other routes into Birmingham (e.g. the Chase Line) could free up any potential paths between Wolverhampton and Birmingham, as this is a prerequisite to being able to operate such a service. This is in line with aspirations set out in Centro's *HS2 – Unlocking the Benefits – West Midlands Connectivity Package* (2013) report for three services an hour to operate between Shrewsbury and Birmingham. The proposal is for the new third train an hour to be a direct service to London, with calls at Sandwell & Dudley, Wolverhampton, Telford Central, Wellington and terminating at Shrewsbury.

Finally we think that there is merit in revisiting the business case for Line Speed Improvements and Electrification of the route, taking into account the potential future growth in passenger traffic along the route which we have derived.

## 6.4. Discussion of Other Options

This section considers the lower ranking proposals identified in Table 6.4 in further detail, making use of previous rail studies where appropriate.

### 6.4.1. Shrewsbury to Birmingham Line Speed Improvements

Network Rail has considered the infrastructure enhancements required to increase line speeds on the Shrewsbury to Wolverhampton route to 90mph running. This would allow for reduced journey times, increased capacity and improved operational resilience and flexibility. The route previously operated at 90mph running, but was reduced 30 years ago following a change in rail services.

A study by Atkins[19] found that 90mph running could be introduced between Bilbrook and Madeley Junction. Using data obtained from Network Rail's New Measurement Train, the study found that the existing track was in a satisfactory condition, requiring minimal investment (including realignment and localised component replacement) to allow for increased line speeds. However, operating trains above 80mph, as desired, would have significant implications on maintenance costs on the line which would impact the benefit-cost ratio of line speed improvements.

This option was ranked seventh in our prioritised list of schemes.

### 6.4.2. Shrewsbury to Wolverhampton Line Electrification

Electrification of the Shrewsbury to Wolverhampton line was included in the Electrification Route Utilisation Strategy (RUS) (2009), under option D17.5: '*Electrify Wolverhampton to Shrewsbury. Extend Euston to Wolverhampton services to Shrewsbury and run Mid and North Wales services to Shrewsbury instead of Birmingham.*' The RUS noted that electrification of the route could allow for:

- An extension of hourly Euston to Wolverhampton services through to Shrewsbury, thus providing an hourly direction Shrewsbury to London service;
- Conversion of hourly Birmingham to Shrewsbury services to electric traction; and

[19] Wolverhampton-Shrewsbury Linespeed Improvement Project Permanent Way Pre-GRIP 4 Study (Atkins for Network Rail, 2011)

- Services from Birmingham International to Machynlleth and North Wales could start/terminate at Shrewsbury instead.

However, with a benefit-cost ratio (BCR) of 1.0, the scheme was not selected for development in CP5. This option was ranked ninth in our prioritised list of schemes.

### 6.4.3. Shrewsbury to Birmingham Incremental Improvements

The enhancements detailed above require significant levels of capital investment in the rail infrastructure. As an alternative to this, smaller incremental improvements to rail services could be implemented that do not require investment in track infrastructure but potentially deliver high value benefits. Discussion with Network Rail raised a number of potential improvements, including:

- Changing the rolling stock operating on the Shrewsbury to Birmingham line could improve journey times without requiring line speed improvements. This can be achieved through faster acceleration and deceleration of modern units (e.g. Class 172 DMU);
- Increasing the service frequency operating between Shrewsbury and Birmingham by having an additional LM or ATW service, resulting in three trains per hour operating between the stations. This would help relieve passenger capacity issues which may otherwise prove a constraint to passenger growth in the future; and
- Amending the passenger timetable to allow for a regular 30 minute frequency between Shrewsbury and Birmingham.

The incremental improvements detailed here could potentially serve to meet passenger growth in the medium term, with capital investment (such as line speed improvements or electrification) meeting longer term aspirations.

### 6.4.4. Shrewsbury Parkway Station

In 2004 a Demand Forecast and Feasibility Study was undertaken to consider the implications of a new Shrewsbury Parkway station to the east of the town. The case for the station was based on the poor access to Shrewsbury station for car and bus users, given the high levels of congestion in Shrewsbury centre. The Parkway Station would provide a large car parking facility (with no charge), thus reducing congestion in Shrewsbury centre. In addition, alongside the proposed station there would be a park and ride facility for those wishing to travel into Shrewsbury centre.

The demand levels assumed in the study are generally lower than current levels of passenger demand, which is expected given that ten years have passed since the study was undertaken.

The study found that there would be a high level of abstraction of current demand from Shrewsbury Station to the new Parkway Station, totalling approximately 75% of all trips on the top twenty service flows (based on revenue). Overall, abstracted demand to the new station would be approximately 528,400 – 40% of all trips from Shrewsbury Station. Abstraction would be driven by both the free parking available at the Parkway site and also reduced rail journey times for those passengers travelling east into Birmingham etc.

In addition to abstracting trips, it was calculated that 41,120 new trips would be brought about by the new station, equivalent to 8% of trips that would be abstracted from Shrewsbury Station.

Overall, the study concluded that in itself, the levels of demand calculated justified a new Parkway Station. However, it would be unlikely that the station would achieve significant increases in ticket revenue for the TOCs, and in fact could reduce revenue given that the cost of fares for passengers travelling east would be reduced. Given this, it would be unlikely that the TOCs would invest in a new station and therefore there would have to be a significant level of subsidy to pay for the approximate £3million cost of the proposed station (and associated works). Additionally, one of the TOCs consulted as part of the study expressed concern that adding in an additional stop on the Birmingham to Shrewsbury route may require the removal of a stop from the existing service pattern.

The growth we have forecast in this study for demand from Shrewsbury Station is based on unrestricted growth. Parking limitations, congestion and access constraints to the station will place a restriction on future growth and so any options to remove this restriction should be considered. In light of this, the significant increases in passenger demand since the Shrewsbury Parkway Feasibility Study was undertaken and the

increase in parking fees for parking at Shrewsbury Station (the study assumed a fee of £2.50/day however the fee is currently £4.40/day), the business case for a Shrewsbury Parkway station may have changed.

We therefore consider that it may be prudent to revisit the business case for Shrewsbury Parkway Station taking into account the actual growth in rail patronage since the study was undertaken in 2004 and the growth potential along the route which we have derived for this study.

This option was ranked eighth in the prioritised list of schemes.

### 6.4.5. Ironbridge Gorge Line Reopening

In recent years there have been two proposals for improving rail access to Ironbridge Gorge, the *Ironbridge Rail Access Study* (2008) and the *Access to Ironbridge – A Sustainable Route to Regeneration* (2014) proposal.

Alongside other heritage rail options, the *Ironbridge Rail Access Study* proposed a passenger rail service between Ironbridge and Wolverhampton. The service would make use of an existing freight line, calling at three new stations (Coalbrookdale, Madeley and Stirchley) and existing stations between Shifnal and Wolverhampton. The service would have to be a new one, as extending existing services was not an option given the nature of the existing service routes.

The capital investment costs for the scheme were estimated at being £6-10million, with an annual operating cost of £1.3million (assuming two train sets would be required). A number of infrastructure and operational constraints would have to be overcome, including finding available rolling stock, providing turnaround facilities and timetabling the services around existing service patterns.

The study forecast demand would range between 127,000 and 176,000 passengers, generating between £386,000 and £542,000 revenue per annum. The scheme would bring about wider benefits including reduced congestion and accidents, and improved air quality by removing 1.2million car kilometres from the highway network.

The business case for the scheme was found to be relatively week, achieving a BCR of between 0.2 and 0.6. However, a higher BCR of 1.5 could be generated using an optimistic set of assumptions and therefore the study concluded that the option was open to further study.

The report concluded that in the short term, an alternative option to develop a heritage steam railway between Ironbridge and Coalport should be pursued. This would be a tourist focused service, providing connections between attractions and serving as an attraction in its own right.

The work undertaken as part of our study has found no evidence to suggest a change in circumstance since the *Ironbridge Rail Access Study* was produced. Indeed, the work that we have undertaken to date has highlighted the potential conflict between operating a Wolverhampton to Ironbridge service and the aspiration to operate an additional Shrewsbury to Birmingham service.

The second proposal - *Access to Ironbridge – A Sustainable Route to Regeneration* – calls for a new rail link and seven new stations, including Ironbridge Parkway. The basis for the proposal is that the closure of the Ironbridge Power Station in 2015 provides an opportunity to re-use the site for economic regeneration and provide a new sustainable railway for the area to accommodate demand from tourists to the area. No data on cost, BCR or timescale have been provided, though it is suggested in the proposal that:

- £16m in new annual revenue could be generated for the local economy;
- 272,000 new rail journeys could be created, generating £2.1m in new rail revenue;
- 16% modal shift could be achieved; and
- 400 cars could be removed from Ironbridge Gorge each day.

Given the significant costs involved with building a new railway and seven new stations, it is unlikely that the potential benefits are high enough to produce a strong BCR. With the limited funding available for rail in the region and the economic gains that can be achieved through other improvements to the network, there is as yet no evidence to suggest this should be a high priority for rail investment in the Marches region, hence the proposal scoring tenth in our prioritised list of schemes.

### 6.4.6. Introduction of local services between Leominster and Rotherwas / Holme Lacy

In 2012 the Rotherwas Rail High Level Business Case Study was undertaken to consider the high level business case of providing a new local rail service from Leominster to Rotherwas, via, Hereford, with a potential extension on to Holme Lacy. This proposal would require the reinstating of abandoned rail track and the building of new stations at Rotherwas and Holme Lacy. The proposal for this was based on the opportunity to improve public transport provision to the Enterprise Zone at Rotherwas Industrial Estate.

The study highlighted a number of operational and economic issues in achieving the proposed service level of a half hourly service between Leominster and Rotherwas, including:

- There are a number of timetabling conflicts between the proposed Leominster-Rotherwas service and existing services on the Marches line that would need to be overcome;
- Extending the service to Holme Lacy would add significant capital costs to the proposal and make a half hourly service very difficult to achieve;
- Economic analysis should the Leominster-Rotherwas option as having a relatively low BCR of 0.7-1.8;
- Potential wider economic benefits of providing better access to the Enterprise Zone would be unlikely to improve the business case for the proposals;
- Under both options, significant levels of revenue support would be needed to subsidise the service. Given local authority resource constraints, the likelihood of receiving revenue support from the local authority is low, whilst central government would be unlikely to also support revenue funding; and
- Land ownership and acquisition were also found to be barriers to achieving the proposals.

Atkins has reviewed the proposals outlined in the Rotherwas Study and considered the merits of introducing the proposed services. The findings of this review suggest that the Rotherwas Study has been optimistic in forecasting a BCR in the range of 0.7 – 1.8, as the higher end of this range could only be achieved under a high demand scenario and by stripping out optimism bias. Given the limited resources available for local rail improvements, alternative schemes with higher BCRs should be considered as a greater priority for investment. As such, the Leominster to Rotherwas and Leominster to Holme Lacy scheme proposals have ranked eleventh and twelfth, respectively, in the scheme prioritisation list.

### 6.4.7. Reopening of the Wellington to Stafford Line

In 2009 the Association of Train Operating Companies produced a report calling for, amongst others, the reopening of the rail line between Wellington and Stafford, which was closed as part of the Beeching rail cuts[20]. The principle argument in favour of the route was that faster journeys times between Shrewsbury and London could be achieved. This proposal was lobbied for further by the Shropshire, Telford and the Marches Strategic Rail Group, who placed a £230million price tag on the works[21].

At the end of the Stafford section of the route, the route of the former rail alignment has been identified in the soon to be adopted local plan as part of a major housing development site. In addition Network Rail has identified that the only remaining section of route, which is currently used as a siding, is surplus to requirements and is available for development for housing and employment purposes from December 2015[22]. This effectively extinguishes the possibility of reopening the route along its former alignment which means that if a route from Welling to Stafford was to be considered in the future it would need a new alignment at a significant additional cost to that previously assumed. As such, the scheme has ranked thirteenth in our prioritised list of schemes.

[20] Connecting Communities: Expanding Access to the Rail Network (2009)

[21] Plan unveiled to restore Telford to Stafford rail line (2011) Accessed: 21/02/14 http://www.shropshirestar.com/news/2011/03/29/plan-unveiled-to-restore-telford-to-stafford-rail-line/

[22] Letter from Network Rail to Stafford Borough Council, 11th March 2013, re local plan strategic development location (http://www.staffordbc.gov.uk/live/Documents/Programme%20Officer/Programme%20Officer%202013/N3b---Letter-from-Network-Rail-regarding-Wester-Access-Route.pdf)

# 7. Summary and Recommendations

This study has shown that enhancements to the rail services and infrastructure in the Marches region will be required in the future in order to accommodate the potential growth in rail patronage up to 2024. A number of key conditional outputs have been identified which will need to be met to enable the growth potential to be realised. We have also identified some potential solutions to meet the conditional outputs. These are summarised in Table 7.1.

**Table 7.1 Summary of Findings**

| Route | Conditional Outputs | Recommended Potential Solutions |
|---|---|---|
| **Hereford to Birmingham** | **Atkins:**<br>• The requirement for additional passenger capacity in the future.<br>**Network Rail (From Market Study);**<br>• Increasing the frequency of services between Worcester and Birmingham;<br>• Reduced journey times between Hereford and Worcester; and<br>• Additional car parking capacity to accommodate rail demand. | • Install double track on sections of the route between Shelwick Junction and Great Malvern to enable the operation of 3 trains per hour, per direction. |
| **The Marches Route** | • The requirement for additional future passenger capacity into both Hereford and Shrewsbury on the Marches Line. | • Exploring the opportunities provided by the re-signalling of the route for re-timetabling existing services and potentially accommodating new services; and<br>• Consideration should be given to the potential of operating an additional 'local' service over the Marches Line. |
| **Shrewsbury to Birmingham Route** | • The need to provide an even service pattern along the route;<br>• The requirement for additional passenger capacity in the future; and<br>• The need for improved journey times from Shrewsbury and Telford to Wolverhampton and Birmingham. | **Short Term**<br>• Work with NR/LM & ATW to look at getting a regular 30 minute interval service along the route;<br>• Examine potential for lengthening of peak period services to meet short term future demand.<br>**Medium – Long Term**<br>Examine potential for providing 3tph in peak periods at 20 minute intervals<br>Revisit the business case for Line Speed Improvements and Electrification, taking into account the potential future growth in passenger traffic a |
| **Shrewsbury Parkway Station** | None Identified | Update the business case for Shrewsbury Parkway Station taking into account the actual growth in rail patronage since the study was undertaken in 2004 and the growth potential along the route which we have derived for this study. |
| **Reopening of the Wellington to Stafford Line** | None Identified | Not recommended for any further study |
| **Ironbridge Gorge Line** | None Identified | Not recommended for any further study |

| Route | Conditional Outputs | Recommended Potential Solutions |
|---|---|---|
| **Reopening** | | |
| **Leominster to Rotherwas/ Holme Lacy** | None Identified | Not recommended for any further study |

# Appendix A. Population Change

**Table A.1 Population Change Summary (Seasons) – PDFH V5.0 and V5.1**

| Destination Station | Origin Station | Annual Base Travel (2011) | Base Population within 5km of Station | Future Population within 5km of Station | Local Population Change | Wider Area Population Change (TEMPRO) | Local/Wider Population Change | Elasticity | Metric |
|---|---|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 20,328 | 41,700 | 51,598 | 1.237 | 1.066 | 1.161 | 1.0 | 1.161 |
| | Ledbury | 6,776 | 8,400 | 9,618 | 1.145 | 1.066 | 1.074 | 1.0 | 1.074 |
| | Colwall | 1,210 | 14,500 | 14,668 | 1.012 | 1.066 | 1.066 | 1.0 | 1.066 |
| | Shrewsbury | 48,642 | 53,000 | 63,243 | 1.193 | 1.111 | 1.075 | 1.0 | 1.075 |
| | Wellington | 33,396 | 45,300 | 52,656 | 1.162 | 1.159 | 1.003 | 1.0 | 1.003 |
| | Oakengates | 2,420 | 70,200 | 81,599 | 1.162 | 1.159 | 1.003 | 1.0 | 1.003 |
| | Telford Central | 65,582 | 71,900 | 83,575 | 1.162 | 1.159 | 1.003 | 1.0 | 1.003 |
| | Shifnal | 8,470 | 20,800 | 23,255 | 1.118 | 1.111 | 1.007 | 1.0 | 1.007 |
| | Cosford | 2,904 | 7,600 | 8,440 | 1.111 | 1.111 | 1.111 | 1.0 | 1.111 |
| | Albrighton | 8,954 | 9,400 | 9,784 | 1.041 | 1.111 | 1.111 | 1.0 | 1.111 |
| | Codsall | 12,826 | 46,800 | 49,533 | 1.058 | 1.058 | 1.058 | 1.0 | 1.058 |
| Hereford | Leominster | 20,675 | 12,990 | 16,492 | 1.270 | 1.066 | 1.191 | 1.0 | 1.191 |
| | Ludlow | 13,085 | 12,566 | 13,909 | 1.107 | 1.111 | 1.111 | 1.0 | 1.111 |
| | Craven Arms | 1,309 | 4,274 | 5,041 | 1.180 | 1.111 | 1.062 | 1.0 | 1.062 |
| | Church Stretton | 523 | 5,299 | 5,867 | 1.107 | 1.111 | 1.111 | 1.0 | 1.111 |
| | Shrewsbury | 2,094 | 77,273 | 87,516 | 1.133 | 1.111 | 1.020 | 1.0 | 1.020 |
| | Abergavenny | - | 19,306 | 20,908 | 1.083 | 1.052 | 1.029 | 1.0 | 1.029 |

**Table A.2 Population Change Summary (Non-Seasons) – PDFH V5.0 and V5.1**

| Destination Station | Origin Station | Annual Base Travel (2011) | Base Population within 5km of Station | Future Population within 5km of Station | Local Population Change | Elasticity | Metric |
|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 63,672 | 41,700 | 51,598 | 1.237 | 1.0 | 1.237 |
| | Ledbury | 21,224 | 8,400 | 9,618 | 1.145 | 1.0 | 1.145 |
| | Colwall | 3,790 | 14,500 | 14,668 | 1.012 | 1.0 | 1.012 |
| | Shrewsbury | 152,358 | 53,000 | 63,243 | 1.193 | 1.0 | 1.193 |
| | Wellington | 104,604 | 45,300 | 52,656 | 1.162 | 1.0 | 1.162 |
| | Oakengates | 7,580 | 70,200 | 81,599 | 1.162 | 1.0 | 1.162 |
| | Telford Central | 205,418 | 71,900 | 83,575 | 1.162 | 1.0 | 1.162 |
| | Shifnal | 26,530 | 20,800 | 23,255 | 1.118 | 1.0 | 1.118 |
| | Cosford | 9,096 | 7,600 | 8,440 | 1.111 | 1.0 | 1.111 |
| | Albrighton | 28,046 | 9,400 | 9,784 | 1.041 | 1.0 | 1.041 |
| | Codsall | 40,174 | 46,800 | 49,533 | 1.058 | 1.0 | 1.058 |
| Hereford | Leominster | 64,758 | 12,990 | 16,492 | 1.270 | 1.0 | 1.270 |
| | Ludlow | 40,986 | 12,566 | 13,909 | 1.107 | 1.0 | 1.107 |
| | Craven Arms | 4,099 | 4,274 | 5,041 | 1.180 | 1.0 | 1.180 |
| | Church Stretton | 1,639 | 5,299 | 5,867 | 1.107 | 1.0 | 1.107 |
| | Shrewsbury | 6,558 | 77,273 | 87,516 | 1.133 | 1.0 | 1.133 |
| | Abergavenny | - | 19,306 | 20,908 | 1.083 | 1.0 | 1.083 |

# Appendix B. Economic Activity Summary

**Table B.1 PDFH V5.0: Economic Activity Summary (Seasons)**

| Destination Station | Origin Station | Annual Base Travel (2011) | Base GDP/Capita or Jobs | Future GDP/Capita or Jobs | Change in GDP/Capita or Jobs | Elasticity | Metric | Notes |
|---|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 20,328 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Ledbury | 6,776 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Colwall | 1,210 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Shrewsbury | 48,642 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Wellington | 33,396 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Oakengates | 2,420 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Telford Central | 65,582 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Shifnal | 8,470 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Cosford | 2,904 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Albrighton | 8,954 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Codsall | 12,826 | 574,000 | 674,455 | 1.175 | 1.0 | 1.175 | Elasticity is 1.0 as station is less than 20 miles from destination |
| Hereford | Leominster | 20,675 | 39,291 | 48,947 | 1.246 | 1.0 | 1.246 | Elasticity is 1.0 as station is less than 20 miles from destination |
| | Ludlow | 13,085 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Craven Arms | 1,309 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Church Stretton | 523 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Shrewsbury | 2,094 | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |
| | Abergavenny | - | 1.00 | 1.25 | 1.250 | 1.5 | 1.391 | - |

**Table B.2 PDFH V5.0: Economic Activity Summary (Non-Seasons)**

| Destination Station | Origin Station | Annual Base Travel (2011) | Base GDP/Capita or Jobs | Future GDP/Capita or Jobs | Change in GDP/Capita or Jobs | Elasticity | Metric | Notes |
|---|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 63,672 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Ledbury | 21,224 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Colwall | 3,790 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Shrewsbury | 152,358 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Wellington | 104,604 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Oakengates | 7,580 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Telford Central | 205,418 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Shifnal | 26,530 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Cosford | 9,096 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Albrighton | 28,046 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Codsall | 40,174 | 1.00 | 1.25 | 1.250 | 0.85 | 1.206 | Elasticity is 0.85 as station is less than 20 miles from destination |
| Hereford | Leominster | 64,758 | 1.00 | 1.25 | 1.250 | 0.85 | 1.206 | Elasticity is 0.85 as station is less than 20 miles from destination |
| | Ludlow | 40,986 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Craven Arms | 4,099 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Church Stretton | 1,639 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Shrewsbury | 6,558 | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |
| | Abergavenny | - | 1.00 | 1.25 | 1.250 | 1.1 | 1.274 | - |

**Table B.3 PDFH V5.1: Economic Activity Summary (Seasons)**

| Destination Station | Origin Station | Annual Base Travel (2011) | Base GDP/Capita or Jobs | Future GDP/Capita or Jobs | Change in GDP/Capita or Jobs | Elasticity | Metric | Notes |
|---|---|---|---|---|---|---|---|---|
| **Birmingham** | Hereford | 20,328 | 429,000 | 496,955 | 1.158 | 1.3 | 1.211 | - |
| | Ledbury | 6,776 | 429,000 | 496,955 | 1.158 | 1.3 | 1.211 | - |
| | Colwall | 1,210 | 429,000 | 496,955 | 1.158 | 1.3 | 1.211 | - |
| | Shrewsbury | 48,642 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| | Wellington | 33,396 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| | Oakengates | 2,420 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| | Telford Central | 65,582 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| | Shifnal | 8,470 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| | Cosford | 2,904 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| | Albrighton | 8,954 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| | Codsall | 12,826 | 574,000 | 674,455 | 1.175 | 1.3 | 1.233 | - |
| **Hereford** | Leominster | 20,675 | 31,000 | 40,656 | 1.246 | 1.3 | 1.423 | - |
| | Ludlow | 13,085 | 31,000 | 40,656 | 1.246 | 1.3 | 1.423 | - |
| | Craven Arms | 1,309 | 31,000 | 40,656 | 1.246 | 1.3 | 1.423 | - |
| | Church Stretton | 523 | 31,000 | 40,656 | 1.246 | 1.3 | 1.423 | - |
| | Shrewsbury | 2,094 | 31,000 | 40,656 | 1.246 | 1.3 | 1.423 | - |
| | Abergavenny | - | 31,000 | 40,656 | 1.246 | 1.3 | 1.423 | - |

**Table B.4 PDFH V5.1: Economic Activity Summary (Non-Seasons)**

| Destination Station | Origin Station | Annual Base Travel (2011) | Base GDP/Capita or Jobs | Future GDP/Capita or Jobs | Change in GDP/Capita or Jobs | Elasticity | Metric | Notes |
|---|---|---|---|---|---|---|---|---|
| **Birmingham** | Hereford | 20,328 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Ledbury | 6,776 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Colwall | 1,210 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Shrewsbury | 48,642 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Wellington | 33,396 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Oakengates | 2,420 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Telford Central | 65,582 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Shifnal | 8,470 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Cosford | 2,904 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Albrighton | 8,954 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Codsall | 12,826 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| **Hereford** | Leominster | 20,675 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Ludlow | 13,085 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Craven Arms | 1,309 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Church Stretton | 523 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Shrewsbury | 2,094 | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |
| | Abergavenny | - | 1.00 | 1.25 | 1.250 | 1.2 | 1.302 | - |

# Appendix C. RPI+1% Forecasts

**Table C.1 PDFH 5.0 Summary with RPI+1% (rail passengers rounded to nearest 100)**

| Destination Station | Origin Station | 2011 Base: Seasons | 2011 Base: Non-Seasons | Total 2011 Base rail travel to Birmingham and Hereford | 2024 Forecast: Seasons | % Change | 2024 Forecast: Non-Seasons | % Change | Total 2011 Base rail travel to Birmingham and Hereford | % Change |
|---|---|---|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 20,300 | 63,700 | 84,000 | 29,200 | 44% | 89,300 | 40% | 118,500 | 41% |
| | Ledbury | 6,800 | 21,200 | 28,000 | 9,000 | 32% | 27,600 | 30% | 36,600 | 31% |
| | Colwall | 1,200 | 3,800 | 5,000 | 1,600 | 33% | 4,300 | 13% | 5,900 | 18% |
| | **Hereford Line Sub-Total** | **28,300** | **88,700** | **117,000** | **39,800** | **41%** | **121,200** | **37%** | **161,000** | **38%** |
| | Shrewsbury | 48,600 | 152,400 | 201,000 | 64,700 | 33% | 206,100 | 35% | 270,800 | 35% |
| | Wellington | 33,400 | 104,600 | 138,000 | 41,500 | 24% | 137,800 | 32% | 179,300 | 30% |
| | Oakengates | 2,400 | 7,600 | 10,000 | 3,000 | 25% | 10,000 | 32% | 13,000 | 30% |
| | Telford Central | 65,600 | 205,400 | 271,000 | 81,400 | 24% | 270,700 | 32% | 352,100 | 30% |
| | Shifnal | 8,500 | 26,500 | 35,000 | 10,600 | 25% | 33,600 | 27% | 44,200 | 26% |
| | Cosford | 2,900 | 9,100 | 12,000 | 4,000 | 38% | 12,100 | 33% | 16,100 | 34% |
| | Albrighton | 9,000 | 28,000 | 37,000 | 12,300 | 37% | 33,100 | 18% | 45,400 | 23% |
| | Codsall | 12,800 | 40,200 | 53,000 | 14,600 | 14% | 46,800 | 16% | 61,400 | 16% |
| | **Shrewsbury Line Sub-Total** | **183,200** | **573,800** | **757,000** | **232,100** | **27%** | **750,200** | **31%** | **982,300** | **30%** |
| | **Birmingham Destination Sub-Total** | **211,500** | **662,500** | **874,000** | **271,900** | **29%** | **871,400** | **32%** | **1,143,300** | **31%** |
| Hereford | Leominster | 20,700 | 64,800 | 85,400 | 28,700 | 39% | 88,200 | 36% | 117,000 | 37% |
| | Ludlow | 13,100 | 41,000 | 54,100 | 18,000 | 37% | 51,400 | 25% | 69,400 | 28% |
| | Craven Arms | 1,300 | 4,100 | 5,400 | 1,700 | 31% | 5,500 | 34% | 7,200 | 33% |
| | Church Stretton | 500 | 1,600 | 2,200 | 700 | 40% | 2,100 | 31% | 2,800 | 27% |
| | Shrewsbury | 2,100 | 6,600 | 8,700 | 2,600 | 24% | 8,400 | 27% | 11,100 | 28% |
| | Abergavenny | - | - | - | - | 27% | - | 23% | - | 24% |
| | **Hereford Destination Sub-Total (exc. Abergavenny)** | **37,700** | **118,100** | **155,800** | **51,700** | **37%** | **155,600** | **32%** | **207,500** | **32%** |

**Table C.2 PDFH 5.1 Summary with RPI+1% (rail passengers rounded to nearest 100)**

| Destination Station | Origin Station | 2011 Base: Seasons | 2011 Base: Non-Seasons | Total 2011 Base rail travel to Birmingham and Hereford | 2024 Forecast: Seasons | % Change | 2024 Forecast: Non-Seasons | % Change | Total 2011 Base rail travel to Birmingham and Hereford | % Change |
|---|---|---|---|---|---|---|---|---|---|---|
| Birmingham | Hereford | 20,300 | 63,700 | 84,000 | 26,400 | 30% | 87,800 | 38% | 114,300 | 36% |
| | Ledbury | 6,800 | 21,200 | 28,000 | 8,200 | 21% | 27,100 | 28% | 35,200 | 26% |
| | Colwall | 1,200 | 3,800 | 5,000 | 1,400 | 17% | 4,300 | 13% | 5,700 | 14% |
| | **Hereford Line Sub-Total** | 28,300 | 88,700 | 117,000 | 36,000 | 27% | 119,200 | 34% | 155,200 | 33% |
| | Shrewsbury | 48,600 | 152,400 | 201,000 | 59,600 | 23% | 202,700 | 33% | 262,300 | 30% |
| | Wellington | 33,400 | 104,600 | 138,000 | 38,200 | 14% | 135,500 | 30% | 173,800 | 26% |
| | Oakengates | 2,400 | 7,600 | 10,000 | 2,800 | 17% | 9,800 | 29% | 12,600 | 26% |
| | Telford Central | 65,600 | 205,400 | 271,000 | 75,100 | 14% | 266,200 | 30% | 341,200 | 26% |
| | Shifnal | 8,500 | 26,500 | 35,000 | 9,700 | 14% | 33,100 | 25% | 42,800 | 22% |
| | Cosford | 2,900 | 9,100 | 12,000 | 3,700 | 28% | 11,900 | 31% | 15,600 | 30% |
| | Albrighton | 9,000 | 28,000 | 37,000 | 11,300 | 26% | 32,500 | 16% | 43,900 | 19% |
| | Codsall | 12,800 | 40,200 | 53,000 | 15,900 | 24% | 50,600 | 26% | 66,500 | 25% |
| | **Shrewsbury Line Sub-Total** | 183,200 | 573,800 | 757,000 | 216,300 | 18% | 742,300 | 29% | 958,700 | 27% |
| | **Birmingham Destination Sub-Total** | 211,500 | 662,500 | 874,000 | 252,300 | 19% | 861,500 | 30% | 1,113,900 | 27% |
| Hereford | Leominster | 20,700 | 64,800 | 85,400 | 31,200 | 51% | 95,300 | 47% | 126,500 | 48% |
| | Ludlow | 13100 | 41000 | 54,100 | 18,400 | 40% | 52,600 | 28% | 71,000 | 31% |
| | Craven Arms | 1300 | 4100 | 5,400 | 1,800 | 38% | 5,600 | 37% | 7,400 | 37% |
| | Church Stretton | 500 | 1600 | 2,200 | 700 | 40% | 2,100 | 31% | 2,800 | 27% |
| | Shrewsbury | 2100 | 6600 | 8,700 | 2,700 | 29% | 8,600 | 30% | 11,300 | 30% |
| | Abergavenny | - | - | - | - | 30% | - | 26% | - | 27% |
| | **Hereford Destination Sub-Total (exc. Abergavenny)** | **37,700** | **118,100** | **155,800** | **51,200** | **45%** | **164,200** | **39%** | **219,000** | **41%** |

# Appendix D. Sifting Process

**Table D.1 Sifting Criteria**

| | Score | | | | | | |
|---|---|---|---|---|---|---|---|
| **Objectives** | **-3** | **-2** | **-1** | **0** | **+1** | **+2** | **+3** |
| Local Objectives | Large adverse | Moderate adverse | Slight adverse | Neutral | Slight beneficial | Moderate beneficial | Large beneficial |
| Wider strategic case | Large adverse | Moderate adverse | Slight adverse | Neutral | Slight beneficial | Moderate beneficial | Large beneficial |
| Value for Money Case | Very high (>>£100m) | High (>£100m) | Medium (£50-100m) | Low (£0-50m) | | | |
| Likely scale of Benefit Cost Ratio | | Benefits likely to be less than cost of scheme | | | Benefits likely to be greater than costs | | Benefits likely to be significantly greater than costs |
| Deliverability of infrastructure / rolling stock | Very challenging | Moderately challenging | Slightly challenging | No significant issues | | | |
| Operational feasibility | Very challenging | Moderately challenging | Slightly challenging | No significant issues | | | |
| Significant issues relating to interaction with Crossrail, and other passenger and freight services | | Not compatible with other wider services | | Unknown at this stage | | Compatible with other wider services | |
| Fundability - Likelihood of securing funding | | Low likelihood | | | Medium likelihood | | High likelihood |

**Table D.2 Detailed Results**

| Options | Primary Objectives | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Improve the reliability of transport Networks | Providing key social linkages | Improve accessibility of Jobs and Essential Services | Help to protect the natural environment | Unlock housing & Employment sites | Improve Resilience of transport Networks | Wider Strategic Case | Value for Money | BCR | Deliverability of infrastructure | Operational feasibility | Significant issues relating to interaction with other passenger and freight services | Fundability (cost / funding sources) | Score |
| Double track Shelwick Junction to Great Malvern | 2 | 1 | 1 | 0 | 3 | 3 | 2 | -1 | 1 | -1 | 0 | 2 | 1 | 14 |
| Additional service on the Marches line | 1 | 2 | 2 | 0 | 2 | 1 | 2 | 0 | 1 | -1 | -1 | 2 | 1 | 12 |
| Re-time timetable on the Marches line | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 1 | 7 |
| Regular frequency on Shrewsbury-Birmingham line | 2 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | -2 | 0 | 1 | 5 |
| Train lengthening on Shrewsbury-Birmingham line | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | -1 | 0 | 2 | 1 | 5 |
| 3 TPH on Shrewsbury-Birmingham line | 1 | 2 | 2 | 0 | 1 | 1 | 2 | 0 | 1 | -1 | -3 | -2 | -2 | 2 |
| Line speed improvements on Shrewsbury-Birmingham line | 1 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | -2 | -2 | -1 | 2 | -2 | 0 |
| Shrewsbury Parkway station | 0 | 2 | 2 | -2 | 1 | 1 | 2 | 0 | -2 | -2 | -1 | 0 | -2 | -1 |
| Electrification on Shrewsbury-Birmingham line | 0 | 0 | 1 | 1 | 0 | 0 | 2 | -1 | -2 | -2 | -1 | 2 | -2 | -2 |
| Ironbridge Gorge station | 0 | 1 | 1 | -1 | 0 | 0 | 1 | -1 | -2 | -1 | -2 | 0 | -2 | -6 |
| New local service Leominster to Rotherwas via Hereford | 0 | 1 | 1 | -1 | 0 | 0 | 1 | -1 | -2 | -2 | -2 | -2 | -2 | -10 |
| New local service Leominster to Holme Lacy via Hereford | 0 | 1 | 1 | -1 | 0 | 0 | 1 | -2 | -2 | -2 | -2 | -2 | -2 | -11 |
| Wellington to Stafford line | 0 | 1 | 1 | -2 | 0 | 1 | -1 | -3 | -2 | -3 | -3 | 0 | -2 | -13 |

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