

# Appendix to the 20 year plan

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## 1. Summary

This appendix supports the 20 year Peninsula Rail Task Force (PRTF) plan 'Close the gap' and provides additional information to support the PRTF case for resilience, faster journeys and more capacity on our rail network within and to/from the South West peninsula.

The South West peninsula has the opportunity through the right investment in its rail infrastructure to contribute to UK plc through potential transport benefits of £1.8bn and wider economic benefits of £7.2bn.

We have suffered from severe weather incidents over the last few years that have highlighted the poor resilience of our rail infrastructure, culminating in the events of flooding across the Somerset levels and the collapse of the cliffs and the seawall at Dawlish, closing large sections of our strategic rail network for several months. Network Rail warn that closure to the mainline at Dawlish will occur every 4 years by 2065 if no decisive action is taken to address the problems. In addition, we suffer from significant levels of service disruption as a result of trains being used that cannot operate past the seawall at times of high winds and waves, further reducing reliability.

The ability to use diversionary routes east of Exeter is limited due to capacity constraints and has a major impact on established local services when London Paddington services are diverted via this route. Travelling west, once you pass Exeter there is no diversionary route available, with a single mainline to Penzance at an average speed of 60mph.

Improved connectivity is at the heart of a modern, vibrant society and our Journey times to the South West peninsula have not changed for 30 years, meaning that our average journey time is just 69mph, compared to 90mph on the East and West Coast's.

The Exeter to Waterloo line is currently underutilised, but it is key to local transport and growth plans around Exeter and serves as an important second strategic link between the peninsula and London. It is constrained by long, single track sections which limit both the number and speed of trains, not just in the peninsula but also in neighbouring authorities of Dorset and Wiltshire.

The connection to Bristol and the Midlands is a critical artery to support regional connectivity, housing growth and the development of key infrastructure, e.g. Hinkley C.

Transport spending in the South West peninsula has been an average of £35, per head, compared with an average of £97 per head across the UK and it is plain to see that we are trailing behind other areas in investment, a situation that will only get worse as a result of current and planned rail infrastructure projects like; HS2 and Crossrail.

Our trains are some of the oldest in the UK, with an average age of 32 years old and currently unable to meet the regulatory requirements from 2020.

Rail growth over the last 21 years has reached 128%, and continues to grow. It is clear that both network and train capacity will not be sufficient in the future. This position is compounded by the difference between rail industry growth predictions used for planning future capacity of between 2% and 3.2% and average growth over the last 7 years of 5.7%.

In a society that values the ability to work and communicate on the move, the ability to use Wi-Fi and mobile phones whilst travelling across the rail network is at best patchy and at worst unusable.

The PRTF has spent the last 14 months working closely with the rail industry to identify solutions to address the problems that we face.

The rail network has to be made more resilient, especially along the critical seawall/cliff sections at Dawlish and Teignmouth. Network Rail have recognised that action is needed now and have so far spent £3m to identify the works that needs to be undertaken to address this. The flood alleviation schemes for the Somerset levels and on the approaches to Exeter need to be completed. To complement the infrastructure resilience there needs to be investment in new trains to ensure a reliable service can operate all year, and that all trains are fit for customer needs.

We recognise that December 2018 will bring some new trains for the region, with some small reductions in journey times and increased capacity. There is further opportunity to build on the benefits that these new trains can deliver, through exploring sections of selective electrification. The PRTF believe that the introduction of 2 direct trains an hour from Paddington to the west of Exeter will allow an opportunity to provide faster journey times, although it seeks that existing services are maintained. The studies that have been undertaken have shown that there are opportunities to reduce journey times to Plymouth by up to 49 minutes in the long term.

Development of 2 trains an hour to Bristol and the Midlands is key to managing future growth predictions along that corridor.

Upgraded diversionary infrastructure is required between Exeter and Castle Cary to allow diverted Paddington services and timetabled local services to operate simultaneously. In conjunction with this diversionary capability there are opportunities to strengthen the 2<sup>nd</sup> strategic route into the peninsula by substantially reducing journey times and increasing capacity between Exeter and Waterloo.

Capacity will be increased between Plymouth and Penzance from December 2018 through the signalling enhancements being undertaken by Cornwall County Council and Network Rail. It is also clear that capacity between Plymouth and Exeter will be insufficient for future growth and additional infrastructure and capacity will be needed, which could include the Dawlish additional line.

We recognise that significantly reducing journey times takes time, however we need to act now to raise our game and allow business to be able to work on the train, for leisure travellers to be able to use streaming media, and to raise the level of customer experience to one envied across the UK.

There is the opportunity to significantly improve the resilience to our rail infrastructure to the South West. Making Dawlish resilient will maintain our connection to the rest of the UK and help prevent losses of up to £1.2bn as seen in 2014. Improving the diversionary route east of Exeter to Castle Cary will have an economic benefit of £50m over the next 30 years.

75% of business in the South West identified that rail is important to their business and that a 45 minute reduction in journey times to London would have a significant impact on their business.

Studies have shown that £1.5bn investment will reduce journey times by 26 minutes between London and Penzance and will generate £7.2bn in economic benefits and £1.8bn in transport benefits.

£155m investment on the Exeter to Waterloo route will generate £677m in transport benefits through reducing journey times by 36 minutes and increasing capacity.

The information within this appendix and the 20 year plan has been prepared in conjunction with the members of PRTF, stakeholders and with assistance from the following parties;

- Department for Transport
- Network Rail
- Great Western Railway
- Cross Country Trains
- South West Trains
- Partners in Wiltshire and Dorset Local Authorities

## 2. Introduction

The rail network is regarded as the South West peninsula's spine, and with the correct investment and development, it is key to realising the South West peninsula's economic potential. In order to achieve this, an effective and resilient railway is vital to protect the current economic productivity and performance of the area and to allow it to grow.



The South West peninsula rail network is predominantly based on a single main artery (the Penzance to London mainline), which connects a number of regional and rural networks. There is a second line to London Waterloo from Exeter that is under-utilised, with longer journey times and low capacity.

Historically, central government investment in the South West's transport infrastructure is the lowest of any region in the UK at £193 per head compared to a regional average of £276 per head, and just £35 per head for railways, compared to a regional average of £97 per head.<sup>1</sup>

***If the South West peninsula rail funding matched the average annual regional rail spend, an additional £126.5m would be available each year.***

As highlighted within the PWC report for the Smith Institute "Transport is an area where the UK lags internationally, being ranked just 27th in the World Economic Forum's 2014-15 Global Competitiveness Index, and falling since 2011-12."

Investment in rail will permit a virtuous circle of economic growth to be created: further investment in businesses, a growth in employment and other economic development, generated by reduced journey times and greater train frequencies to other parts of the country.

The journey times to the South West peninsula from London have remained relatively consistent since the introduction of the Intercity 125 High Speed Train's in the 1970's.

<sup>1</sup> Productivity and Wider economic impact study PRTF 2015



*The re-letting of franchises that serve the South West peninsula in 2019 present an opportunity to push for and achieve a step change in provision of services and the customer experience.*

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The PRTF are looking to Government to make our railway resilient, to allow consistency and growth, speed up journeys to reduce our periphery from major centres, create a step change in passenger experience, to aid the growth of productivity and to provide sufficient capacity and comfort for current and predicted growth in passengers to the South West.

## 2.1. Resilience

The South West peninsula is served by a single mainline west of Exeter and during 2014 was cut off from the rest of the UK through flooding on the Somerset levels, the collapse of the seawall at Dawlish and the landslip between Dawlish and Teignmouth. It is estimated that these events cost the South West peninsula's economy over £1.2bn.

*If no action is taken Network Rail warn that the route West of Exeter will see increased closure, which is predicted to reach once in every 4 years by 2065.*

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Photos; Network Rail

These events followed significant disruption in the previous years through flooding at Cowley Bridge, outside Exeter, that closed the railway for 15 days.



Photos; Network Rail

Given the level of environmental change that is predicted in the future, ensuring that the coastal route and also those other routes threatened by flooding have resilient infrastructure and are also operationally resilient is critical. Further details of the East of Exeter resilience works are contained in section 6.1.

***The remedial actions following the weather events between 2012 and 2014 to areas vulnerable to flooding have not removed the future risk only reduced it.***

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This infrastructure vulnerability is compounded by the use of trains that are unable to operate if overtopping of the seawall at Dawlish is forecast, leading to further instances of service cancellations.

One of the key industry measures for customers is performance and whilst we recognise the steps that the rail industry has taken to improve performance in recent years, with less than 50% <sup>2</sup> of our services arriving on time more needs to be done. Equally we recognise that this performance measure based on arrival times at a train's destination does not reflect the travel patterns or customer experience of many of those who may have left or joined on route and suffered delay.

***This has led to 36 days of disruption since the railway was reopened at Dawlish, with less than 50% of our long distance trains arriving on time<sup>3</sup>***

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Severe weather is not unique to the peninsula, but as the westernmost part of England, the region is subject to far more extreme weather incidents than many central or eastern areas and this combined with the topography of our rail route increases our vulnerability.

***Rail is very important to the economy of the South West peninsula which is reflected in the £68m that Local Authorities have spent on rail related improvements since 2000.***

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In addition to the seawall concerns there are sections of cliffs between Dawlish and Newton Abbot that if failures occur they can have a significant impact on the running of the railway and could result in closures such as those witnessed in 2014.

The resilience of the rail lines into and out of the South West peninsula cannot just be delivered by Network Rail in isolation and requires a multi-agency approach to deal with the long term problems to drive sustainable improvements based on climate change.

***A multi-agency approach should be taken to long term sustainable resilience schemes, and include the wider social and economic benefits as part of the benefit appraisal.***

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<sup>2</sup> Network Rail right time performance figures p4 2016 (GWR LD 45%, XC LD 45%)

<sup>3</sup> Network rail right time performance p4 2016

Being able to rely on regular, reliable and cost effective public transport is essential to many people, every day, every week, in order to get to work, education, and training or for leisure activities.



Photos Network Rail

***The daily maintenance and upkeep of the rail network in the South West peninsula and its supporting structures is a primary role of NR and the PRTF expects that any resilience work required will be undertaken as part of their funded maintenance and enhancement obligation.***

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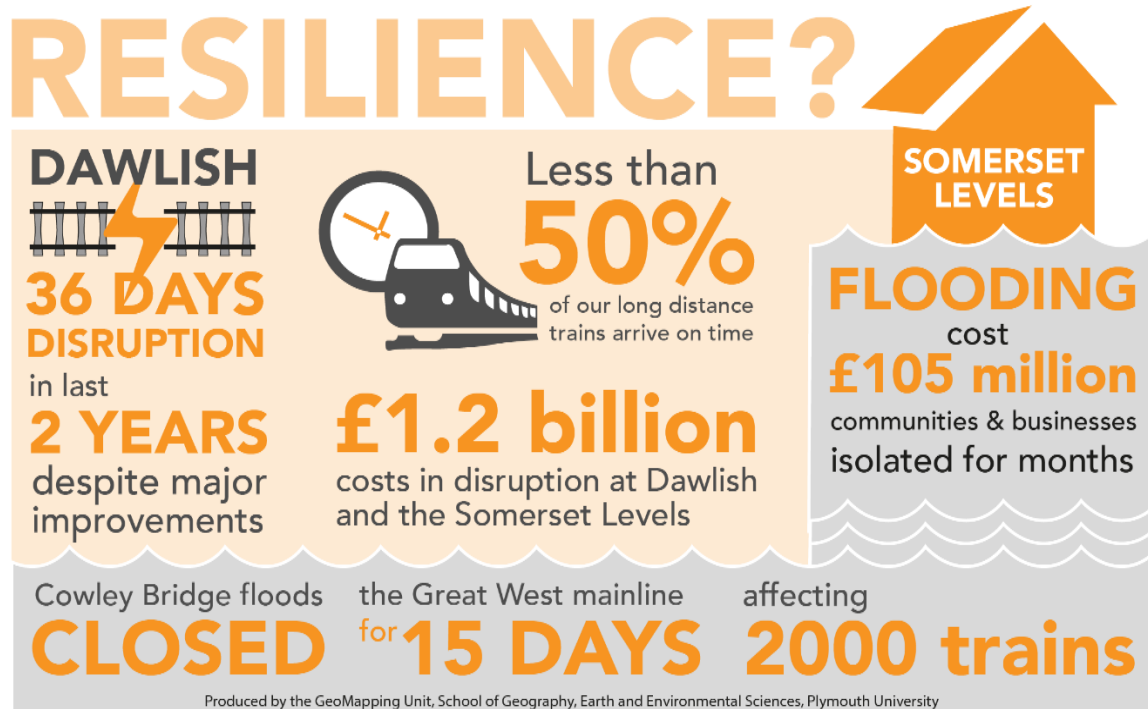
The peninsula geography creates over-dependency on the reliability of these single rail routes – and limits connectivity with e.g. over 100,000 people in north Cornwall and north west Devon with no effective access to the rail network.

***1 in 5 people in Devon do not have a car.***

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The business community have stated through the business survey, that resilience is their number one concern.





## 2.2. Journey Times and wider connectivity

Journey times to the South West peninsula have remained the same for the last 30 years and need to be updated to meet today's growth and productivity needs within the region. It is clearly recognised that even modest reductions in journey times between markets can have a significant impact on increased productivity. This is backed up by research that shows a clear relationship between productivity levels and travel time from London, with a 6% productivity reduction for every 100 minutes travel time<sup>4</sup>.

*Our average speed to and from London is only 69mph compared to 90mph on the East and West Coast mainlines and over 50% of our business rated faster journey times as a top priority.<sup>5</sup>*

It should also be recognised that the South West peninsula is way behind other parts of the UK in relation to journey times and earliest arrivals from London, as demonstrated in figure 1;

<sup>4</sup> Productivity and Wider economic impact study PRTF 2015

<sup>5</sup> PRTF business survey June 2016

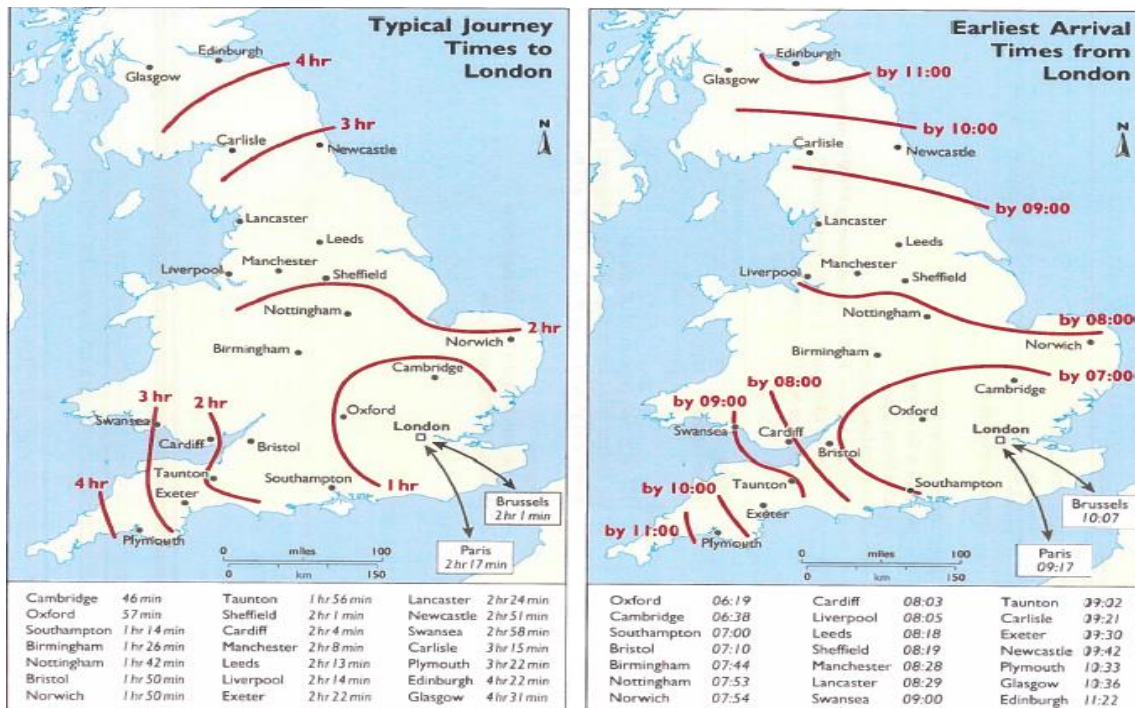


Figure 1. Typical journey times and earliest arrivals across the UK

### 2.2.1. Wider Connectivity

Access to the rail network is a key element of success for a distributed economy like the South West with many small towns and businesses. Local train services provide access to the inter-city network in addition to linking towns with the major economic centres including Plymouth, Exeter and Bristol. In 2014/15 there were 25m journeys to and from the South West peninsula by rail, a rise of 4.2% over 2013/14, many of which were to locations other than London.<sup>6</sup>

Whilst east-west connectivity between the South West peninsula and London is of key strategic importance to support economic growth, we recognise opportunities exist within and between regions of the South West, Swindon and the Western Wiltshire corridor, the South Coast and the West Midlands.

Research undertaken in 2010 by SQW consultants identified the broad functional economic market areas across the South West region. These functional areas along the north / south axis need to be nurtured and built upon to maximise the economic performance of the South West peninsula. The rail network has the potential to strengthen economic relationships between these areas by offering quick and direct access to markets and labour.

<sup>6</sup> Regional Rail Usage (passenger Journeys) 2014-15 Annual Statistical Release January 2016

There is a significant body of empirical evidence of the agglomeration benefits realised by towns and cities from investment in improved transport links. By bringing towns and cities 'closer together' businesses can benefit through better access to larger specialised labour pools, shared knowledge and greater opportunity for interaction along the supply chain. Reducing journey times and/or increasing the frequency of services can improve productivity levels.

Within the South West peninsula there are tens of thousands of jobs planned directly along the railway corridor (see table 1). This is in addition to significant growth planned at Cheltenham, Gloucester and Birmingham. Improved rail services between London and the South West are needed to offer improvements in connectivity along this north-south spine. This will assist in maximising the potential benefits from growing the economic interrelationships along this rail corridor from Birmingham to Plymouth.

Bristol Temple Quarter Enterprise Zone	17,000 jobs	Taunton J25 Strategic Employment Site	4,000 jobs
Weston Super Mare J21 Enterprise Area	10,000 jobs	Taunton Firepool Development	1,800 jobs
Bridgwater Hinkley Point	15,000 jobs	Exeter & East Devon and Sedgemoor Enterprise Zones	17,800 jobs
Plymouth	18,600 jobs	Birmingham Enterprise Zone	40,000 jobs

Table 1. Planned jobs along the rail corridor

Between Plymouth and Birmingham the railway directly serves a population of approximately 2.2 million people<sup>7</sup>. All of this is contained within a corridor which can be accessed with a 3.5 hour train journey end to end. Each of the main towns and cities along this corridor already has functional economic relationships with each other, albeit with those relationships being stronger where they are geographically closer. A drive to reduce journey times and improve connectivity along the corridor has the potential to deliver significant economic benefits.

	Population	Journey Time from Plymouth (minutes)
Plymouth	300,000	NA
Exeter	125,000	60
Taunton	65,000	90
Bristol	442,000	120
Cheltenham	113,000	165
Gloucester	120,000	185
Birmingham	1,100,000	210

Table 2. Main conurbations, population and journey time from Plymouth

<sup>7</sup> This figure relates only to the towns and cities with a mainline station and does not include the wider population who may travel to use the train services

Passenger numbers along the corridor have been increasing year on year with an average of 60% increase in station entry and exit numbers between 2004/5 and 2014/15<sup>8</sup>. There has been limited change to the level and quality of service in this time in relation to rolling stock, journey frequency and journey time.

The mix of slower and faster trains between Taunton and Bristol can cause problems. Between Taunton and Plymouth there are a higher number of services as this is where GWR and Cross Country Services converge. Between Taunton and Bristol, the number of services, particularly fast services, decreases.

*From Dec 2018 the number of services between Taunton and Bristol decreases as GWR will run fewer London-Bristol-Exeter services.*

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GWR also operates a Taunton to Cardiff service (extended to Exeter 2/3 times per day) which serves local Stations between Taunton and Bristol – these services are on an hourly frequency and relatively slow. Service patterns, departure times and journey times vary throughout the day for both GWR and Cross Country creating a poor level of service for the travelling public.

It is important that the enhancement of long-distance services and route capacity is arranged in a complimentary fashion to ensure the needs for the provision of frequent services between the many secondary tier towns throughout the region and their local centres, including Salisbury, Yeovil, Exeter and Truro are not compromised.

*Doubling of the off-peak frequency at Bradford-on-Avon in December 2008 caused a sustained trebling of the annual growth rate of passenger numbers, continued at least as far as the latest available data (2014-15). Most of the increase is in off-peak and contra-peak flows.*

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Notwithstanding the attractions of a regular interval timetable, train services and the trains themselves must meet the requirements of the specific markets travelling to and from the South West. This includes recognising the significant role of leisure and education travel and the need to minimise inconvenience to travellers with luggage. Through services, tightly-planned connections (same/cross platform) and suitable train interiors are components of this requirement.

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<sup>8</sup> Office of Rail and Road [www.orr.gov.uk](http://www.orr.gov.uk)



*A 2014 survey over three days revealed that 36% of passengers on the new TransWilts service were connecting with other services at Swindon or Westbury.<sup>9</sup>*

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Bristol, Wiltshire Dorset and the Solent are easily within the “day visit” range for business and leisure journeys to the SW peninsula, but opportunities are limited by the poor service pattern. Earlier westbound and a better spread of eastbound opportunities are necessary to fulfil this requirement. The weekend travel patterns are significantly different from midweek. While this is unlikely to affect line speed requirements it needs to be reflected in consideration of service patterns, destinations and rolling stock needs.

### **2.3. Capacity and Comfort**

During the last 12 months, the South West peninsula has seen in excess of 50 million rail journeys, 25 million of these to destinations within the peninsula, on what is essentially a single spine mainline network, fed by a number of key local lines.

*Rail travel in the South West peninsula has continued to grow. Since 1995/6 passenger growth has increased by 128%, outstripping industry forecasts consistently*

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In 2014/15, 11.5million rail journeys were undertaken to/from London, comparable with the number from the West Midlands and greater than the North West and East Midlands.

*Journeys undertaken within the peninsula have grown at a rate of 5.9% over the last year.*

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This growth has stretched capacity in the region and we recognise that the national pool of rolling stock within the UK rail industry is under enormous pressure due to the increase in passenger numbers year on year seen since privatisation. This shortage has been compounded by the lack of a national rolling stock replacement programme, with emphasis being placed on franchise renewals to drive new rolling stock procurement.

*Much of the train fleet in our region is unable to meet the disability requirements from 2020 and is the 2nd oldest in the UK<sup>10</sup>*

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<sup>9</sup> Wiltshire Council / TWCIC passenger survey October 2014.

<sup>10</sup> ORR Data Portal June 2016



Photo: Cross Country Trains

As the South West peninsula is the only region currently without any clear plans for electrification, there needs to be a debate about replacement diesel fleets versus electrification and new electrified rolling stock. Many of the trains being used to provide local and regional services are fast approaching or in some cases have passed their design life and do not benefit from changes that have been made within rolling stock over the last 30 years, from a performance, customer experience or accessibility.

*New rolling stock is needed that meets the needs of today's customers and opens up opportunities to increase on train and on track capacity.*

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Photo: DCRP

*“The single biggest challenge for Britain’s railway is how to provide the capacity we need for the future” (Mark Carne, Chief Executive, NR).*

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The rail traveller of today expects to be able to access mobile and Wi-Fi services as the norm, with the expectation that it will be available wherever we travel. This is key for business in being able to make travel productive, for leisure and tourism to have access to online or streaming media during travel and for people within the peninsula to carry on with their daily lives.

## 2.4. The Productivity Gap

While productivity in the economy of the South West is on a similar level to several other regions it lags behind the UK average. The most productive UK regions are London and the South East; the South West is significantly behind them and in the latest data from 2014 the South West was ranked 8th out of 12 UK regions, ahead of only the North East, North West, Yorkshire/Humberside and Northern Ireland.

Within the South West there is an economic gradient between the more productive areas around Bristol, Swindon and Bournemouth and the South West peninsula. While output per worker and average earnings varies across the South West peninsula, overall they are persistently below the national average.

*One of the key reasons for this productivity gap is the peripherality of the South West peninsula which places businesses at a distance from their markets.*

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Research conducted using detailed assessment of ONS data in 2005 concluded that there was a clear relationship between productivity levels and travel time from London, with a 6% productivity gap per 100 minutes travel time<sup>11</sup>. More recent work conducted for PRTF suggests that this conclusion is still valid, and the latest regional and local economic growth statistics show that the productivity gap is persistent and possibly widening.

*The relatively low density of development in the Peninsula means that the economy does not benefit from the agglomeration impact experienced in areas such as London and the South-East, or the Midlands.*

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Tackling this productivity gap is a key aim for the Local Enterprise Partnerships and Local Authorities of the South West peninsula. The strategic economic plans for the Heart of the South West and Cornwall and Isles of Scilly seek to drive up economic growth from 2.6% per annum experienced in the past few years, beyond the UK average over the same period of 2.8% to a transformational 3.1%.

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<sup>11</sup> Productivity and Wider economic impact study PRTF 2015

Area	GVA/head £	% change 2010-2014
Cornwall/ Isles of Scilly	17,278	9.2
Plymouth	19,864	14.3
Torbay	15,534	9.5
Devon	20,146	8.5
Somerset	19,648	11.4
South West Region	22,324	8.9
United Kingdom	24,616	12.7

Table 3. Regional GVA and % change 2010-2014

Even at this level averages must be treated with caution because they mask significant inter-regional variation. While some of our urban areas punch well above their weight, and investment in connectivity there will accelerate productivity, other urban and rural areas are being left behind. Cornwall is the only English area classified by the EU as "less developed", with poor connectivity and moderate skills levels being major barriers to growth.

The relatively low density of development in the peninsula means that the economy does not benefit from the agglomeration impact experienced in areas such as London and the South-East, or the Midlands.

The average regional spend on rail in the UK is £97 per head, in the South West it is £35, and the cumulative effect of this over the last 20 years is a £2.5bn shortfall.

*If the South West received the regional average in rail spending it would have an additional £2.5bn to spend in the next 20 years*

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## 3. What is required?

The PRTF seeks investment and improvements to our railway that make it at least as resilient as other parts of the network, journey times and connectivity that drive economic development, and with sufficient capacity and comfort to ensure demand is met and a step change is achieved in the passenger experience.

*"We need to find a way to get ahead of the game - to think about problems before they hit us".*

*Key Recommendation: "Plan the railway based on customer, passenger and freight needs". (Nicola Shaw, "Shaw Report "):*

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The PRTF has spent a considerable amount of time working with the rail industry and business to define what is needed to deliver economic growth and better connectivity for the South West peninsula, these outputs are detailed within our 20 year plan 'closing the gap'. In addition, the details and outputs from the work streams are detailed within this appendix to provide additional supporting evidence.

### 3.1. Resilience

The main rail line to the South West peninsula must be a resilient and reliable connection, protecting our economy, coast and communities with a resilient sea wall and stable cliffs.

The rail infrastructure that protects our coast and communities must be made resilient to enable rail services to serve the peninsula every day of the year. This does not just mean the seawall and cliffs infrastructure, but also providing an operationally robust service.

***The PRTF seeks Cross Country trains that are capable of operating between Exeter and Plymouth in all weathers.***

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Network Rail are currently undertaking consultation into the options that are available to make the cliffs and seawall between Dawlish Warren and Newton Abbot safe and resilient for the future (see figure 2).



Photo Network Rail

This means completing the current options development and planning the delivery of the preferred option. To date no funding exists to undertake this work before Control Period 6.

***The PRTF welcomes the funding of £10m announced recently to allow this development work to be undertaken before 2019.***

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The analysis that has been undertaken to date has identified that work needs to start on key sections of the cliff resilience work at the earliest opportunity, this urgent section of work is estimated to cost in the region of £270m.

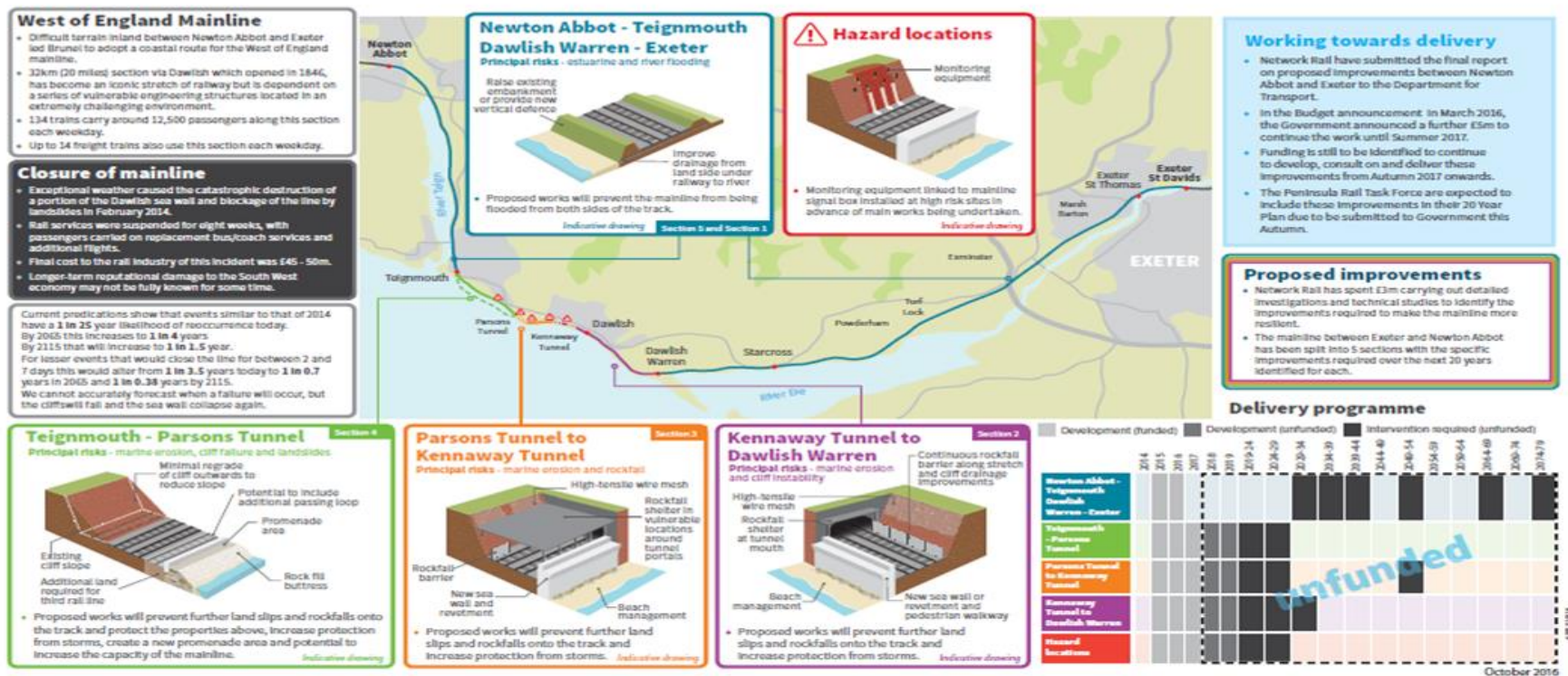
***The PRTF seeks funding before 2019 to allow the critical elements of this work to commence and that long term funding is committed.***

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This is a long term and complex project that is likely to be ongoing in some form for the next 50 years, figure 2 and Sections 3.6 and 6 of this appendix provides further information about the activities required in the project.



## Critical resilience work between Exeter and Newton Abbot



Graphic courtesy of Network Rail

Equally other routes that serve the region should be made resilient to prevent further disruption across the Somerset levels and through Cowley Bridge, along with suitable and sufficient resilience along the diversionary route between Exeter and Castle Cary (via Yeovil) to allow London services to operate on a regular timetable when diverted, without compromising local connectivity. Additional detail from the study is contained in section 6.2.

***The PRTF seeks £3.4m to undertake the GRIP 3 study between Exeter and Castle Cary via Yeovil to allow diverted London Paddington trains to operate without impacting local services.***



Photo; Flooding 2014 Somerset County Council

***Planned flood mitigation schemes by Network Rail and the Somerset River Authority between Taunton and Exeter must proceed as planned and any diversionary route should be robust and have sufficient capacity to be able to operate without impacting on other services that operate over that route.***

Over the period between 2017 and 2019 we seek the following investment:

**Short term 2017-2019**

Scheme	Benefit
Teignmouth cliffs and Dawlish seawall resilience scheme development.	Allows continuation of improved resilience scheme and speeds up delivery within CP6.
Commencement of the critical initial phase of Dawlish seawall and Teignmouth cliffs resilience scheme (Note see medium term for detail).	Commence the critical elements of a long term plan to improve resilience on the sea wall and cliffs.



Flood resilience works at Cowley, Somerset Levels and Hele & Bradninch.	Reduce the effect of flooding on the rail network and improve resilience leading to better reliability.
Cross Country Trains capable of operating along the seawall in all weathers.	Delivery of reliable services all year round.
Development of the Diversionary route- Exeter to Castle Cary, via Yeovil scheme to GRIP 3 on the diversionary route (DfT Large Major schemes Development Fund bid).	This work will identify the infrastructure requirements to accommodate diverted GWR trains between Exeter and Castle Cary during Somerset Levels flooding and maintenance work.

Over the period between 2019 and 2029 we seek further investment to continue the resilience works at Teignmouth and Dawlish and to deliver the diversionary route improvements between Exeter and Castle Cary via Yeovil.

#### Medium Term 2019-2029

Scheme	Benefit
Dawlish Resilience Plan- Construction of new sea wall and beach nourishment at Kennaway Tunnel and adjacent to Rockstone Footbridge, Central tunnels (rock shelters, drainage and meshing works), Dawlish cliff works (toe barrier and dentition), Teignmouth reclamation and cliff works, including new tunnel portal, throat and track realignment at Parson's Tunnel, new bridge at Smugglers Lane, and meshing and toe barrier at Slocums Bridge.	Continue the critical elements of essential of a long term plan to improve resilience on the sea wall and associated estuaries and reduce the likelihood of weather related disruption.
Castle Cary to Exeter Capacity upgrade *, Additional double track sections on the routes between Castle Cary and Yeovil and Yeovil and Exeter St David's.	Enables the provision of additional local services into Exeter under Devon Metro Phase 2 and improved reliability for long distance services by providing an enhanced diversionary route.

#### Long Term 2029 onwards

Scheme	Benefit
Dawlish Resilience Plan - Construction of new sea wall and beach nourishment at Dawlish beach and station, Construction of new rock revetment between Langstone Rock and Dawlish Warren, Construction of new embankment at Powderham Banks, Construction of steel sheet pile wall at Starcross.	Essential start of a long term plan to improve resilience on the sea wall and associated estuaries and reduce the likelihood of weather related disruption.

The full details of the resilience schemes, benefits and costs identified from the studies are shown in section 5.

## 3.2. Journey Time Improvements and wider connectivity

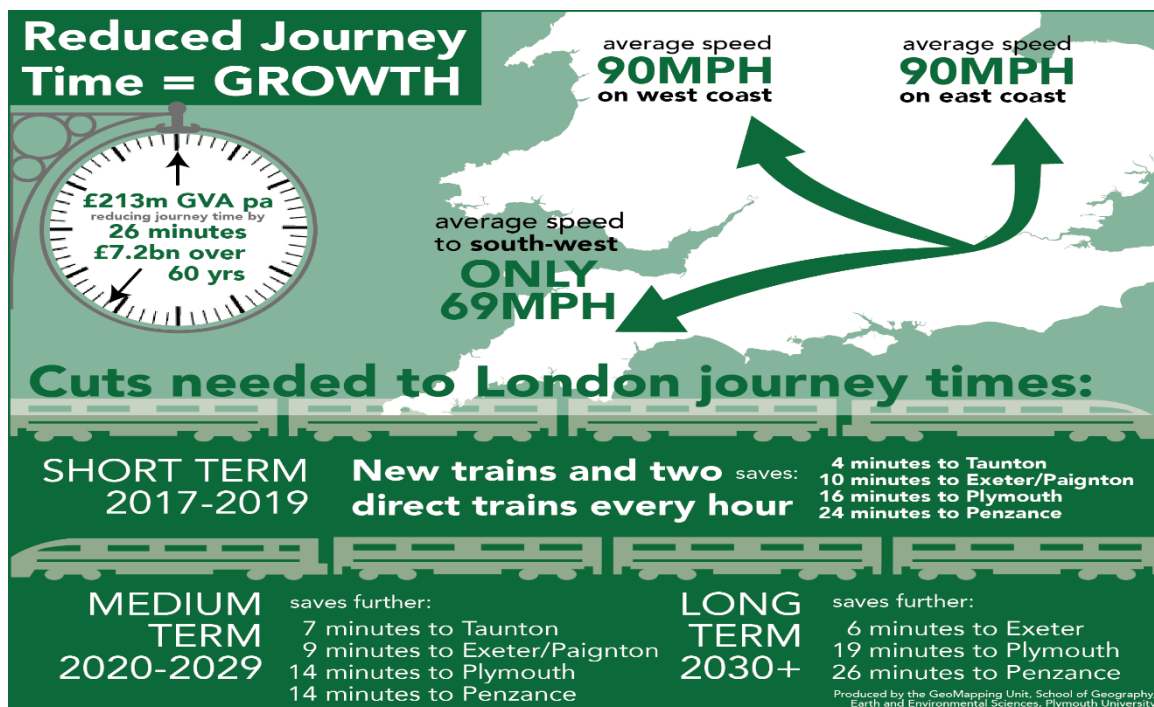
### 3.2.1. Journey Time Improvements

The drive for faster journey times and the associated benefits is sought on the basis that these improvements are in addition to the services and station stops that are currently provided. Connectivity to and from the South West peninsula is critical to allow the region to deliver its growth and productivity potential.

*The South West peninsula needs a high quality, modern rail service that is fast, frequent, reliable and comfortable to enable business to be competitive and to serve the needs of the local communities, based on the following journey times to and from London:*

- Taunton 1h30m
- Exeter 1h45m
- Plymouth 2h15m
- Truro 3h30m

Our average speed to and from London is only 69mph compared to 90mph on the East and West Coast mainlines. This of course will only get worse with HS2.



*In order to achieve the PRTF journey time aspirations, an average journey speed of 100mph is required between London and Plymouth.*

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The outcomes and opportunities shown between Penzance and Paddington are based on the GRIP 2 study that was undertaken by Network Rail on behalf of GWR. The detailed outputs of this study can be found in Appendix 6.4 of this report.

*London to Plymouth journey times can be reduced by up to 16 minutes by December 2019 through the introduction of new trains in December 2018 and two direct trains an hour from London to Plymouth in the 2019 franchise.*

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It is the PRTF's belief that following the improvements in journey times that will be delivered in the December 2018 timetable as part of the direct award, the next target should be the introduction of 2 direct trains per hour between London and Plymouth<sup>12</sup> allowing a further 10 minute reduction. This change would allow the operation of faster services serving Plymouth and beyond.

*The PRTF seeks £17m to develop the GRIP 3 studies for the additional 14 minute journey time improvements to Plymouth and beyond for 2029.*

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. The studies that have been undertaken show that it is possible to upgrade the current line to reduce journey times to Plymouth by up to 49 minutes over the Long Term.

The delivery of journey time improvements will be a combination of infrastructure improvements, timetable changes and maximisation of the benefits of new rolling stock.  
We seek the following investment to deliver journey time improvements:

#### Short Term 2017-2019

Scheme	Benefit
Development of the Paddington route infrastructure schemes with strong business cases from GRIP 2 to GRIP 3, covering Paddington to Penzance.	Clear scheme development and identification of benefits.
Intercity Express Trains introduction, sleeper upgrade and major frequency improvements supported by depot and station capability works.	Improved customer experience through new and upgraded trains and major station upgrades. Improved connectivity and capacity delivered through improved frequencies and longer trains. Reduced journey times Exeter 5 minutes,

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<sup>12</sup> Some additional services may serve Paignton

	Plymouth/Paignton 6 minutes, Penzance 14 min.
2 direct trains per hour between London and Plymouth, <sup>13</sup> Major service improvements through hourly semi-fast services supported by electrification to Bedwyn and major capacity and linespeed improvements between Newbury and Westbury.	Revision of calling patterns to allow 1 train per hour fast and 1 semi fast to stations west of Exeter, reducing fast train journey time by 10 minutes.

#### Medium Term 2019-2029

Scheme	Benefit
West of Great Bedwyn to North of Market Lavington (JTI 4)# Infrastructure enhancements.	Reduce journey times by 2 minutes.
Selective electrification of Dainton bank#, Electrification of railway between Aller Jn and Totnes.	Reduced journey times by 1 minute.
West of Southcote to Kintbury (JTI 2)#, Infrastructure enhancements.	Reduce journey times by 2 minutes.
West of Westbury to West of Taunton (JTI 6)#, Infrastructure enhancements.	Reduce journey times by 5 minutes.
West Newton Abbot to Totnes (JTI 10) #, Infrastructure enhancements.	Reduce journey times by 4 minutes.

#### Long Term 2029 onwards

Scheme	Benefit
Improvements between Exeter and Newton Abbot, Hungerford avoider and around Westbury (JTI 8/3/5)#, Infrastructure enhancements to raise line speed by 10 minutes.	Reduce journey times by 10 minutes.
Dawlish Additional Line, Provide alternative line to avoid Dawlish and reduce journey time to Plymouth and beyond.	Reduce journey times 5 minutes, improve resilience and provide additional network capacity.
Remaining infrastructure changes from GRIP 2 study JTI 1&7#, Infrastructure enhancements.	Reduce journey times by 2 minutes.
Totnes to Penzance infrastructure changes from GRIP 2 study #, Infrastructure enhancements. Totnes to Plymouth linespeed upgrade *, New railway alignments on sections of extreme curvature.	Reduce journey times by 2 minutes.

<sup>13</sup> Whilst maintaining existing service levels

The long term schemes contain elements of significant infrastructure improvement that is likely to be invasive and expensive, this includes the Dawlish additional line. The PRTF recognise that the areas shown within the short and medium term should be pursued and maximised before these long term interventions are considered.

The railway to the South West peninsula has a long and proud history, with much of the infrastructure dating back to the early days of the railway. The timetable and high speed train's in use are 40 years old and outdated in their performance, environmental outputs and their ability to deliver the expectations of society and business needs of today.

***The rail service should be focused around driving economic growth through a step change in service delivery.***

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The delivery of rail services should be through the implementation of outcome based, integrated, innovative and efficient working practices in both operation and network planning that allows opportunities to maximise capacity and reduce costs through the full life of an operator, whilst improving connectivity and interchange facilities and opportunities.

***PRTF expects the rail industry to continually strive to engage and deliver the needs of the passenger, communities and business within the region, pushing forward best practice and striving to lead the industry without being constrained by franchise agreements and length.***

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Due to the diversely located major centres of population and education, there is a clear element of natural centre to centre travel, with travel to work areas into the centres from outlying areas and local lines. This is in addition to the need to travel to major population areas outside the South West peninsula, like London, Bristol, Birmingham and further afield. A key opportunity for the rail industry of the Hinkley Point C construction will be missed without investment in improved rail services to and from Bridgwater.

***The rail specification should be outcome based for the user and deliver a viable and quality alternative to the car, with comparable or better journey times.***

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Fulfilling the needs of these diverse travel patterns currently leads to increased journey times for long distance services, lack of flexibility to respond to seasonal patterns and lack of service specification differentials.

***The service specification is currently based on the economic and passenger needs of 40 years ago. This urgently needs to be updated to reflect not just the travel and business patterns in the South west region today but also the future, in order to meet the needs of the 3***

*distinct groups, long distances, inter-regional and local/tourism/travel to work.*

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### 3.2.2. Exeter to Waterloo

The Exeter to Waterloo service has the opportunity through infrastructure and timetabling changes to reduce journey times significantly. Long, single track sections are a significant constraint, limiting the number of trains and the speed at which they can travel.

Both the Heart of the South West LEP and Dorset LEP have a shared interest in improving journey times between Exeter and London and Weymouth and London and, as a result, are seeking NR to undertake a timetable study, part funded by local authorities and the Heart of the South West LEP. This will determine what may be feasible based upon a series of passing loop infrastructure improvements between Yeovil and Salisbury.

In studies undertaken by the PRTF it has been shown that a reduction of 36 minutes will deliver £677m in direct benefits. More details are included in Section 6.3.

*The PRTF seeks funding of £5m to allow this development work to be undertaken before 2019.*

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Therefore, we seek the following investment:

#### Short Term 2017-2019

Scheme	Benefit
'Exeter-Waterloo timetable study and GRIP 3 infrastructure development for redoubling of track and passing loops between Salisbury and Yeovil.	Enables 2tph trains in both directions between Yeovil junction and Salisbury, significantly reducing journey times and upgrading capacity between Exeter and Waterloo.

As part of developing the long term improvements that could lead to further reductions in journey times Network Rail undertook some initial analysis of the measures that would be needed to reach the PRTF journey time aspirations, these findings are contained within section 6.6 of this report.

## 3.3. Capacity and Comfort

The announcement of new AT300 trains and the additional local rolling stock is welcomed by the PRTF and is urgently needed, but we expect to see the replacement of ageing rolling stock with

modern, fit for purpose vehicles that improve the customer experience, in line with that seen in the north and other places in the UK. Full use of modern technology should be made to ensure planning and delivery of the railway is future proofed.

*Growth in passenger numbers of 128% over the last 21 years means that we require track and train capacity to be made available, if we are not to start suppressing demand and impacting on the economic and tourist growth in the region.*

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Growth within the region has consistently outstripped industry forecasts, with average growth of 5.7% over the last 7 years, compared with the growth rates being used by the rail industry for planning capacity of between 2% and 3.2%. This anomaly means that capacity will not be planned and delivered early enough to meet predicted demand. An example of this variation for 2014-15 saw passenger numbers rise by 8% within Devon and 13.1% to Torbay.<sup>14</sup>



Photo; Noel Harrison of ALRUG

*More on train capacity will be needed between Exeter and Plymouth by 2026, with increased frequency of service by 2036 to meet projected demand.<sup>15</sup>*

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The track capacity requirements will need to be met through additional infrastructure (Dawlish Additional Line, Northern route), or the new digital railway or a mix of both.

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<sup>14</sup> Regional rail usage ORR 2014-2015

<sup>15</sup> DAL Assessment PRTF Feb 2016



### 3.3.1. The Northern Route

During the exploratory work for the 20 year plan considerable effort has been expended to understand the opportunities and challenges posed by the option of the Northern route between Exeter and Plymouth via Okehampton. Additional details of the study outcomes and the methodology used are contained in section 6.8 of this report. This route has the opportunity to significantly improve local connectivity, but like all transport schemes has to be able to generate a business case to progress.

*The PRTF seeks funding of £1.5m to allow the continued development work for the reopening of the Tavistock to Bere Alston route to be undertaken before 2019.*

For the purposes of clarity, the route has been split into 3 likely phases for delivery.

#### Short Term 2017-2019

Scheme	Benefit
Development of the Tavistock to Plymouth line to GRIP 3.	To allow continuation of the scheme development for delivery.

#### Medium Term 2019-2029

Scheme	Benefit
Services running between Okehampton and Exeter and Plymouth to Tavistock.	Passenger services restored, connecting market towns to major peninsula cities, delivering first phases of Northern Route reopening.

#### Long Term 2030+

Scheme	Benefit
Dartmoor Northern Route Phase 3 , Completion of the northern route through a 90mph predominantly single track route between Coleford Junction and Tavistock including a North Cornwall Parkway station.	Provide passenger services to an area of poor accessibility and rural deprivation. Improves connectivity to northern Cornwall. Improves resilience through provision of a diversionary route.

### 3.3.2. Wider Connectivity

PRTF is working with partners in Wiltshire, Dorset and their LEPs to develop a plan for improving services between Exeter and Salisbury (east of Yeovil to complement the GRIP 2 study west of Yeovil) on this second strategic route into the peninsula. Emerging key aims are to deliver:

- Improved journey times between Salisbury, Yeovil and Exeter;



- Extra capacity and better frequencies west of Salisbury and east of Exeter;
- Improved connectivity at Yeovil Junction with the Heart of Wessex line (will also allow for options for better Weymouth – London services)

### 3.3.2.1. The South West to Bristol and the North

Cross Country operates services between Penzance/Plymouth and Birmingham, the North East, North West and Scotland, but regularly suffers from a lack of capacity, particularly south of Bristol. Currently these services serve several different markets along the route, commuters, business, leisure and carry high numbers of holiday makers to and from the South West. In particular, luggage storage capacity can be a problem on the Cross Country services.

*Network Rail's Western Route study identifies that additional capacity south of Bristol is needed no later 2023 to deal with rising passenger numbers<sup>16</sup>*

Rolling stock, journey times and service patterns are failing to deliver a service fit for the 21st century and one that supports the economic growth of the region. A clock face timetable would offer a much better level of service to commuters, business users and also to less frequent travellers.

The LEPs along the rail corridor between Plymouth and Birmingham are working to deliver sizeable business and employment growth projects at or near the railway that the current rail service will not adequately be able to support.

*The PRTF seeks funding of £0.5m to allow this development work to be undertaken before 2019.*

Therefore, we seek the following investment:

Short term 2017-2019

Scheme	Benefit
Development and enhancement of connections and services to the Midlands and Bristol.	Improved journey times and uplift in rolling stock and passenger experience to provide choice and increased regional connectivity.

Medium Term 2019-2024

Scheme	Benefit
Replacement of Cross Country fleet with new bio mode trains that allow step change in service delivery and passenger experience.	Able to utilise the electrification currently provided on sections of routes, increase in capacity, allows 2 trains per hour Exeter to

<sup>16</sup> Network Rail Western Route study Aug 2015

	the peninsula, increases resilience to extreme weather.
Improvement to the Cross Country services between Bristol and west of Exeter.	Timetable to deliver 2 trains per hour to meet passenger growth.

### 3.3.2.2. Bristol and Devon Metro

The West of England Partnership is currently developing the Bristol Metro scheme that will ultimately see a metro style service running across Bristol and as far as Weston Super Mare. Devon County Council is developing the Devon Metro proposal which will serve Exeter and the surrounding towns. Evidence is emerging that a 30-minute service interval is an important goal in the context of medium-distance journeys; this is reflected in plans for the TravelWest network around Bristol and the Devon Metro. It can also be seen in the rapid growth of passenger travel on the Plymouth to Penzance, Swindon- Westbury-Salisbury, Falmouth, Severn Beach and Westbury-Bristol lines. These developments result in a high quality service for these areas, but leave some large population centres and areas with major housing and employment growth between these Metro areas with a comparatively poor rail service.

### 3.3.2.3. South Wales and Westbury to the South Coast

The Cardiff-Portsmouth route intersects the main routes between London and the South West at Westbury and Salisbury. To realise the potential benefits of these connecting hubs involves overcoming the effects of the historical regional partitioning of the railway. This has led to poor coordination between the routes and the administrative division that caused various transport studies over the years, including the multi-modal studies, to omit assessment of the scale of demand. Although the common maritime/technical industrial characteristics of the Solent and Plymouth areas suggest that good links would be economically beneficial, rail journeys between the two areas are hampered by poor connections.

*Plymouth Dockyard, vital to the Royal Navy and the largest in Western Europe, has poor connectivity with UK's second largest, Portsmouth. Only one weekday connection offers a reasonably seamless and fast journey without a disproportionately long wait.*

Westbury provides the faster route but currently there are few services to Plymouth that have good connections from Southampton. The current service pattern does not lend itself to use for a day's business or leisure in the South West. Given appropriately timed calls at Westbury, however, journey time may be reduced by 30-40 minutes (plus the saving from higher speeds discussed elsewhere in this report) and the number of daily travel opportunities radically improved as indicated below:

Southampton-Plymouth; Weekdays		
	Current	Aim
Earliest arrival in Plymouth	10:33	Before 10:00
Journey time of earliest arrival	3h 47m (40 minute connection at Westbury)	Around 3 hours (depending on linespeed improvements west of Westbury)
Other morning arrivals in Plymouth	11:44 (journey time 4h 29m via Reading at much higher fare)	Hourly
Current best option	14:33 arrival in Plymouth (3h 23m journey time with 9 minute connection at Westbury) This is the next reasonable option following the 10:33 arrival.	Hourly (journey time depending on linespeed improvements)
Source: National Rail journey planner		

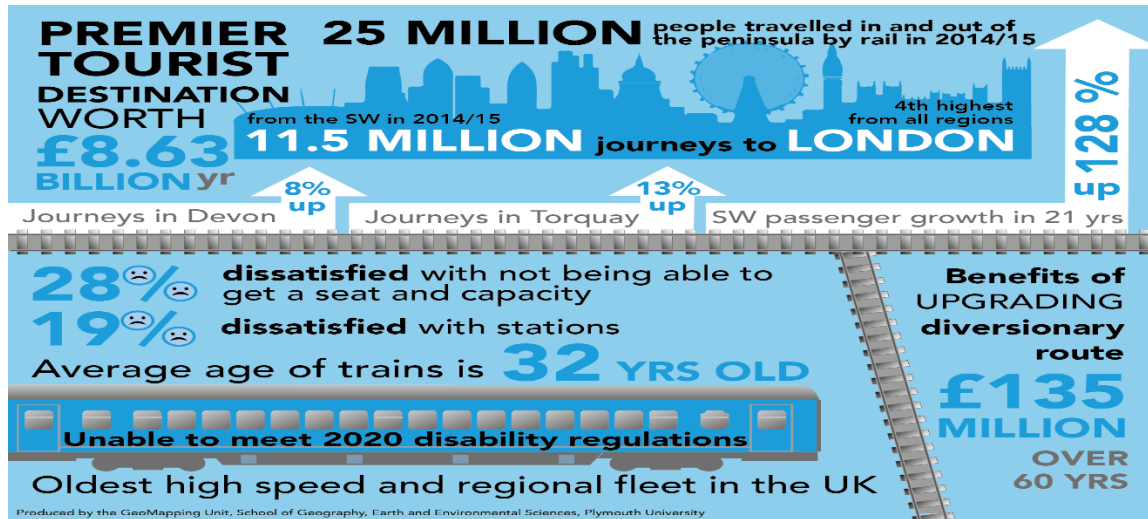
Table 4. Journey times from Southampton to Plymouth

Westbury-Salisbury is the only part of the Cardiff-Portsmouth route with less than two trains per hour. In its franchising feedback, Wiltshire Council has proposed filling this gap and linking with the Salisbury-Southampton-Eastleigh-Romsey route, providing access for the SW region not only to the Solent area itself, but to Southampton Airport and the destinations it offers.

*Southampton Airport has one of the closest check-ins to a railway station in the UK – advertised as 99 steps.<sup>17</sup>*

Westbury also provides the gateway to the South West for a large part of Wiltshire and an alternative route from Swindon, serving a total population of circa 700,000. Passenger demand is not manifest currently due to the limited TransWilts service and the almost complete lack of suitable connections. The Swindon and Wiltshire LEP is considering proposals for a study to evaluate the latent demand for improved connectivity in both the Wiltshire and Solent areas including assessment of economic benefits.

<sup>17</sup> <http://www.southamptonairport.com/to-from-the-airport/by-train/>



### 3.4. The passenger experience

We have talked a great deal in this report about the infrastructure and the equipment that is required to update our railway in the South West peninsula. It is of course vital that the passenger is placed in the centre of all of our thinking, to ensure that the improvements delivered meet the expectations of all users.

Balancing the needs of these different users (long distance, intra-regional and commuter), is always going to present a challenge. Increasingly passengers' expectations of the service and the choice being provided by rail is rising, partly based on society in general and also on the improvements seen in other parts of the transport sector and this must be recognised.

*The satisfaction of the users of the railway in the South West has to be addressed and improved, with satisfaction levels on a downward trend since 2011.<sup>18</sup>*

Around the world, new and modern transport systems place the passenger experience at the heart of development, creating designs and concepts that meet passenger needs in a far more focused and whole journey experience.

*With modern technology we expect to see the development and implementation of modern and user friendly ticketing options that*

<sup>18</sup> Rail Passenger satisfaction (2016) Transport Focus

*allow and encourage cross boundary and wider public transport usage.*

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We recognise that the Government is rolling out free Wi-Fi through the franchise process, but that is only half of the picture. Having the equipment on trains makes no difference if users cannot access or rely the service as a result of the poor mobile phone signal strength in areas that the rail lines pass through. This is a particular problem in rural areas such as Wiltshire, Somerset and South Devon where topography creates an additional challenge alongside a sparse population. Voice and data signals are affected. We request that Government works with Network Rail and mobile phone operators to improve signal strength and reliability on rail lines into the South West.

*Free Wi-Fi on trains is ranked as the 4<sup>th</sup> highest priority for business in the top ten national priorities for passenger improvements<sup>19</sup>*

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It is recognised that until further journey time improvements are possible to the South West peninsula, additional investment is required to improve the productivity of business users and the wider passenger experience for all users using the new AT300 fleet, through the following enhancements;

*-Travelling office - one ticket to provide a seamless and productive journey including reserved parking at stations, Wi-Fi & mobile connectivity for entire journey, at seat service and through ticketing to city centre destinations.*

*-Entertainment centre - to provide long haul airline style media and entertainment service (reducing the demand for Wi-Fi & mobile connectivity), Wi-Fi & mobile connectivity for entire journey, at seat service and increased luggage space.*

*The PRTF seeks funding of £25m to allow this development and delivery work to be undertaken before 2019.*

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Therefore, we seek the following investment:  
Short Term 2017-2019

Scheme	Benefit
Improved customer experience facilities on trains and at stations including major Wi-Fi capability upgrade and on-board entertainment, as a minimum standard.	Allows business to be productive whilst travelling, and provides improved customer experience, Can be built into new trains for delivery.

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<sup>19</sup> Transport Focus Rail Priorities for improvement 2014

Cornish Mainline additional signals scheme.	Improved customer experience through deployment of air conditioned regional stock on mainline stopping services. Improved service frequency at stations throughout Cornwall through provision of additional local services to create 2tph service frequency.
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#### Medium Term 2019-2029

Scheme	Benefit
Additional on train capacity to meet predicted growth between Exeter and Plymouth.	Improved capacity to meet predicted demand, improved customer experience.
Newbury to Westbury capacity upgrade, New and extended loops, including extended up/down reliefs in the Newbury area and a 4 <sup>th</sup> platform at Westbury.	Improves service reliability and enables the provision of frequency enhancements through capacity to accommodate additional passenger and freight in a reliable manner.
Electrification to Bedwyn, Electrification of railway between Newbury and Bedwyn.	Enables deployment of new electric trains between London and Bedwyn improving dwell times and releasing IETs for use on semi-fast services.

### 3.4.1. Stations

The stations in the South West have a rich history and character which should be enhanced and brought into the modern age through the updating and modernising of the customer environments. Given the geography and relative dispersed nature of the population the ability to ‘railhead’ is vital to the people of the south west peninsula. Car parks should be of a high standard that are customer friendly and availability visible to users on approach to aid decision making, with today’s technology is it really right that we expect customers to drive around car parks looking for spaces when its already full.

*Only 81% of customers are satisfied with the stations in the South West.<sup>20</sup>*

<sup>20</sup> National Rail Passenger Survey – NRPS – Spring 2016

Our rail stations within the peninsula should be the gateway to a quality travel experience, for passengers with our main stations;

- Modern, safe and secure, passenger friendly environment at all times of operation that compliments the on train experience
- Well-staffed with competent and customer friendly people
- High quality modern and accessible facilities including toilets, waiting rooms, public spaces and complimentary Wi-Fi.
- Travel plans and real time information that includes buses and other transport modes in the vicinity
- Sufficient car parks that provide space availability information at and on the approaches to the station allowing parking certainty, safe by design and pleasant places to park
- Quality, well planned and user friendly transport interchange facilities

*Stations should be well equipped, customer friendly places that reflect the character of the South West but are fit for purpose in the 21st century, are progressively upgraded through franchise length and meet the expectations of users.*

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The PRTF recognises that local schemes and stations facilities form a significant part of the passenger experience and have identified known and planned station upgrades for the route between Penzance and Taunton. Full details are shown within section 3.5.1.

### **3.5. Electrification**

The benefits of electrification have long been recognised on the railways, probably more so in Europe than in the UK. The benefits of electrification include, greater acceleration and faster journey times, lower train failure rates, improved efficiency and reduced noise pollution amongst others.

The last rail industry Electrification route study identifies many routes that have a positive Benefit Cost Ratio, including Basingstoke to Exeter, Cross Country to Plymouth (5:1) and the Berks and Hants section of the Paddington to Penzance line.

Cornwall County Council and Plymouth City Council commissioned a further study in 2012, refreshed in 2013 on the benefits of electrification to the region which identified that at least £1bn would be saved in operational expenditure over 60 years through electrification in the South West.

The PRTF sees opportunities in the short term for selective area electrification that the new bi-mode trains can use to improve performance and journey times with a view to longer term electrification being considered when the local rolling stock fleet is renewed.

There is also a clear case for replacing Cross Country trains with bi-mode trains that can utilise currently electrified routes where available and also provide a fleet of trains that are resilient enough to operate along the coastal route through Devon.

The improvements for electrification form part of wider benefits and as such are located within the sections for resilience and journey time improvements above.



### 3.6. Strategic outputs and outcomes required

Peninsula Rail Task Force strategic outputs and outcomes								
PRTF strategic outputs	Key Benefits	JT savings to Plymouth	Possible Delivery vehicle	Committed £m		Investment Need £m		Total £m
				Industry	Local	Industry	Local	
Resilience - Short Term Strategy 2017-2019								
Teignmouth cliffs and Dawlish seawall resilience scheme development.	Allows continuation of improved resilience scheme and speeds up delivery within CP6.		Network Rail	5		10		
Commencement of the critical initial phase of Dawlish seawall and Teignmouth cliffs resilience scheme (Note see medium term for detail).	Commence the critical elements of a long term plan to improve resilience on the sea wall and cliffs.		Network Rail			270		
Flood resilience works at Cowley, Somerset Levels and Hele & Bradninch.	Reduce the effect of flooding on the rail network and improve resilience leading to better reliability.		Network Rail/EA	31.3				
Cross Country Trains capable of operating along the seawall in all weathers.	Delivery of reliable services all year round.		Franchise					
Development of the Diversionary route- Exeter to Castle Cary, via Yeovil scheme to GRIP 3 on the diversionary route (DfT Large Major schemes Development Fund bid).	This work will identify the infrastructure requirements to accommodate diverted GWR trains between Exeter and Castle Cary during Somerset Levels flooding and maintenance work.		Network Rail			2.5	0.9	
Total 2017-2019				36.3		282.5	0.9	319.7

Resilience - Medium Term Strategy 2019-2024								
Dawlish Resilience Plan- Construction of new sea wall and beach nourishment at Kennaway Tunnel and adjacent to Rockstone Footbridge, Central tunnels (rock shelters, drainage and meshing works), Dawlish cliff works (toe barrier and dentition), Teignmouth reclamation and cliff works, including new tunnel portal, throat and track realignment at Parson's Tunnel, new bridge at Smugglers Lane, and meshing and toe barrier at Slocums Bridge.	Continue the critical elements of essential of a long term plan to improve resilience on the sea wall and associated estuaries and reduce the likelihood of weather related disruption.		Network Rail	See short term funding				
Castle Cary to Exeter Capacity upgrade *, Additional double track sections on the routes between Castle Cary and Yeovil and Yeovil and Exeter St Davids.	Enables the provision of additional local services into Exeter under Devon Metro Phase 2 and improved reliability for long distance services by providing an enhanced diversionary route.		Network Rail			150		
Resilience - Medium Term Strategy 2024-2029								
Dawlish Resilience Plan - Central tunnels (rock shelters, drainage and meshing works), Dawlish cliff works (toe barrier and dentition), Teignmouth reclamation and cliff works, including new tunnel portal, throat and track realignment at Parson's Tunnel, new bridge at Smugglers Lane, and meshing and toe barrier at Slocums Bridge.	Essential start of a long term plan to improve resilience on the sea wall and associated estuaries and reduce the likelihood of weather related disruption.		Network Rail			151		
<b>Total 2019-2029</b>						<b>301</b>		<b>301</b>
<b>Total Resilience funding requirement to 2029</b>				<b>36.3</b>		<b>583.5</b>	<b>0.9</b>	<b>620.7</b>

Resilience – Long Term Strategy 2030+								
Dawlish Resilience Plan - Construction of new sea wall and beach nourishment at Dawlish beach and station, Construction of new rock revetment between Langstone Rock and Dawlish Warren, Construction of new embankment at Powderham Banks, Construction of steel sheet pile wall at Starcross.			Essential start of a long term plan to improve resilience on the sea wall and associated estuaries and reduce the likelihood of weather related disruption.					
<b>Notes</b> *Recommendations from Western Route Capacity Improvement Programme Castle Cary to Exeter study to confirm likely scope for CP6.								
Journey Times - Short Term Strategy 2017-2019								
Development of the Paddington route infrastructure schemes with strong business cases from GRIP 2 to GRIP 3, covering Paddington to Penzance.	Clear scheme development and identification of benefits.		Network Rail/PRTF			17		
‘Exeter-Waterloo timetable study and GRIP 3 infrastructure development for redoubling of track and passing loops between Salisbury and Yeovil.	Enables 2tph trains in both directions between Yeovil junction and Salisbury, significantly reducing journey times and upgrading capacity between Exeter and Waterloo.		Network Rail/PRTF			5		
Intercity Express Trains introduction, sleeper upgrade and major frequency improvements supported by depot and station capability works.	Improved customer experience through new and upgraded trains and major station upgrades. Improved connectivity and capacity delivered through improved frequencies and longer trains. Reduced journey times Exeter 5 minutes, Plymouth/Paignton 6 minutes, Penzance 14 min.	6	Franchise	350	14			
2 direct trains per hour between London and stations west of Exeter, Major service improvements through hourly semi-fast services supported by	Revision of calling patterns to allow 1 train per hour fast and 1 semi fast to stations west of	10	Franchise					

electrification to Bedwyn and major capacity and linespeed improvements between Newbury and Westbury.	Exeter, reducing fast train journey time by 10 minutes.							
<b>Total 2017-2019</b>		<b>16</b>		<b>350</b>	<b>14</b>	<b>22</b>		<b>386</b>
<b>Journey Times - Medium Term Strategy 2019-2024</b>								
West of Great Bedwyn to North of Market Lavington (JTI 4)# Infrastructure enhancements.	Reduce journey times by 2 minutes.	<b>2</b>	Network Rail			150		
Selective electrification of Dainton bank#, Electrification of railway between Aller Jn and Totnes Improved journey times and improved reliability.	Reduce journey times by 1 minute.	<b>1</b>	Network Rail			29		
<b>Journey Times - Medium Term Strategy 2024-2029</b>								
West of Southcote to Kintbury (JTI 2)#, Infrastructure enhancements.	Reduce journey times by 2 minutes.	<b>2</b>	Network Rail			231		
West of Westbury to West of Taunton (JTI 6)#, Infrastructure enhancements.	Reduce journey times by 5 minutes.	<b>5</b>	Network Rail			513		
West Newton Abbot to Totnes (JTI 10) #, Infrastructure enhancements.	Reduce journey times by 4 minutes.	<b>4</b>	Network Rail			570		
<b>Total 2019- 2029</b>		<b>14</b>				<b>1493</b>		<b>1493</b>
<b>Total Journey times funding requirements to 2029</b>				<b>350</b>	<b>14</b>	<b>1515</b>		<b>1879</b>
<b>Journey Times – Long Term Strategy 2030+</b>								
Improvements between Exeter and Newton Abbot, Hungerford avoider	Reduce journey times by 10 minutes.	<b>10</b>	Delivery vehicle to be confirmed based on the agreed scheme					

and around Westbury (JTI 8/3/5)#, Infrastructure enhancements to raise line speed by 10 minutes.								
Dawlish Additional Line, Provide alternative line to avoid Dawlish and reduce journey time to Plymouth and beyond.	Reduce journey times 5 minutes, improve resilience and provide additional network capacity.	5						
Remaining infrastructure changes from GRIP 2 study JTI 1&7#, Infrastructure enhancements.	Reduce journey times by 2 minutes.	2						
Totnes to Penzance infrastructure changes from GRIP 2 study #, Infrastructure enhancements. Totnes to Plymouth linespeed upgrade *, New railway alignments on sections of extreme curvature.	Reduce journey times by 2 minutes.	2						
<b>Notes</b> * Major linespeed increases not considered on this stretch by Speed to the West but possible if significant infrastructure work undertaken. Indicative of the possible strategic approach only. # Costs taken from Speed to the West study								
<b>Capacity and comfort – Short Term Strategy 2017-2019</b>								
Improved customer experience facilities on trains and at stations including major Wi-Fi capability upgrade and on-board entertainment, as a minimum standard.	Allows business to be productive whilst travelling, and provides improved customer experience, Can be built into new trains for delivery.		Franchise			25		
Cornish Mainline additional signals scheme.	Improved customer experience through deployment of air conditioned regional stock on mainline stopping services. Improved service frequency at stations throughout Cornwall through provision of additional local services to create 2tph service frequency.		Network Rail	6	15			

Development and enhancement of connections and services to the Midlands and Bristol.	Improved journey times and uplift in rolling stock and passenger experience to provide choice and increased regional connectivity.		Franchise					
Development of the Tavistock to Plymouth line to GRIP 3.	To allow continuation of the scheme development for delivery.		Local Authority			1.5		
<b>Total 2017-2019</b>				<b>6</b>	<b>15</b>	<b>26.5</b>		<b>47.5</b>
<b>Capacity and comfort - Medium Term Strategy 2019-2024</b>								
Services running between Okehampton and Exeter and Plymouth to Tavistock	Passenger services restored, connecting market towns to major peninsula cities, delivering first phases of Northern Route reopening.		NR/Franchise/LAs		11.5	48.5		
Replacement of Cross Country fleet with new bio mode trains that allow step change in service delivery and passenger experience.	Able to utilise the electrification currently provided on sections of routes, increase in capacity, allows 2 trains per hour Exeter to the peninsula, increases resilience to extreme weather.		Franchise					
Improvement to the Cross Country services between Bristol and west of Exeter.	Timetable to deliver 2 trains per hour to meet passenger growth.		Franchise					
Newbury to Westbury capacity upgrade ***, New and extended loops, including extended up/down reliefs in the Newbury area and a 4 <sup>th</sup> platform at Westbury.	Improves service reliability and enables the provision of frequency enhancements through capacity to accommodate additional passenger and freight in a reliable manner.		Network Rail			150		
Electrification to Bedwyn **, Electrification of railway between Newbury and Bedwyn.	Enables deployment of new electric trains between London and Bedwyn improving dwell times and releasing IETs for use on semi-fast services.		Network Rail			100		



Capacity and comfort - Medium Term Strategy 2024-2029								
Additional on train capacity to meet predicted growth between Exeter and Plymouth.	Improved capacity to meet predicted demand, improved customer experience.		Franchise					
Castle Cary to Cogload junction capacity upgrade. Additional signal sections to increase capacity by reducing headways.	Improved service reliability and additional capacity.		Network Rail			10		
Dartmoor Northern Route Phase 1B *, Upgrade of the railway between Coleford Jn and Okehampton and additional double track between Cowley Bridge and Coleford Jn.	Enables increase in services to Okehampton and improved journey times on the Barnstaple line.		Network Rail			50		
Exeter to Waterloo line redoubling of track and passing loops between Salisbury and Yeovil.	Faster journey times to raise line speed by 36 minutes on 2nd strategic route, also delivering capacity enhancements.		Network Rail / Franchise			150		
Total 2019-2029					11.5	508.5		520
Total Capacity and comfort funding requirements to 2029				6	26.5	535		567.5
Capacity and comfort - Long Term Strategy 2030+								
Dartmoor Northern Route Phase 3, Completion of the northern route through a 90mph predominantly single track route between Coleford Jn and Tavistock including a North Cornwall Parkway station.		Provide passenger services to an area of poor accessibility and rural deprivation. Improves connectivity to northern Cornwall. Improves resilience through provision of a diversionary route.						
Inclusion in the long term rail industry electrification programme to the South west peninsula, building on partial electrification that has taken place.		Improved resilience, performance benefits, fuel savings and environmental benefits.						
Notes * Assumed similar cost to the Tavistock reopening to cover upgrade of the Okehampton route (GSM R and linespeed etc), creation of long dynamic loop around Crediton by converting and upgrading the parallel single lines to Coleford divergence and extending the existing loop eastwards. **Capacity between Westbury and Reading for mix of passenger and freight was identified as the prime constraint on capacity by the Western Route study. Resolving this is essential to provide reliable journey times. ***Costs taken as approximates from ARUP 2013 study for DfT.								
Short term strategy	2017-2019	16		392.3	29	331	0.9	753.2
Medium term strategy	2020 - 2029	14		0	11.5	2302.5	0	2314

Long term strategy	2030 onwards	19						
<p>Notes: The above summary table is only a snapshot of the types of outcomes that could be achieved if the full programme were fund. The costs indicated are purely illustrative of the scale of funding likely to be required, and will be subject to change based on further development and future option. A more detailed assessment of costs would be needed once the scope of each improvement was more clearly defined. Service frequency improvements may necessitate consideration of capacity enhancements east of Reading, which are currently being considered within the Western Route Capacity Improvement Programme. Includes £431m for Dawlish resilience work</p>		49		392.3	40.5	2633.5	0.9	3067.2

### 3.6.1. Rail Industry and Local schemes

Rail Industry and Local schemes for delivery through local delivery partners							
Industry and Local supporting outputs	Key Benefits	Delivery	Committed £m		Investment Need £m		Total £m
			Industry	Local	Industry	Local	
Short Term Strategy 2017-2019							
Devon Metro Phase 1*,Timetable improvements and longer trains on the Exmouth, Paignton and Barnstaple lines including 2tph Exmouth - Paignton serving the new stations at Newcourt, Marsh Barton and Edginswell.	Improved customer experience through deployment of appropriate rolling stock with air conditioned regional stock on Barnstaple services and commuter stock on Exmouth & Paignton services. Improved service frequency of 2tph between Exmouth and Paignton. Improved service frequency on the Barnstaple line with standard hourly services through the day removing key gaps. New stations service key growth areas at Newcourt, Cranbrook, Marsh Barton and Edginswell.	Franchise					

Bristol to Exeter service capacity options development study.	Define option for service improvements between Taunton and Bristol.	NR/LA			0.5		
Newbury* - Redevelopment of the north side of station including new MSCP and residential/mixed use developments. New footbridge.	Regeneration of surrounding area. 204 additional parking spaces. Step free access between platforms.	GWR franchise	1.8	4.75			
Castle Cary Car Park Phase A, Extension of car park.	30 additional parking spaces.	GWR franchise	0.4				
Taunton Station Masterplan - Redevelopment of south side including new ticket hall, interchange and MSCP. Regeneration of Great Western House and release of land for residential development.	Regeneration of surrounding area in conjunction with Firepool site. Improved customer experience in new ticket hall and interchange. Improved vehicular, pedestrian and cycle access in conjunction with NIDR. 214 additional parking spaces.	LA/NR/GWR	3.6	4.75			
Tiverton Parkway Car Park* -Conversion of temporary coach park (built for Dawlish) into car park. New footpath to the village.	185 additional parking spaces. Improved pedestrian access.	GWR franchise	0.8				
Exeter St Davids Concourse Phase A*, Gateline widening and station entrance improvement..	Improved customer experience and reduced pedestrian congestion within the concourse.	GWR franchise	1.2				
Marsh Barton#	New station	LA		8			
Newton Abbot Gatelines*	Gateline installation and security improvements. Improved customer experience, station security and revenue protection.	GWR franchise	1				
Edginswell station.	New Station	LA		8			
Torquay Access for All*	Access for All footbridge, Step free access between the platforms.	GWR franchise	3				
Totnes Access for All*	Access for All footbridge, Step free access between the platforms.	GWR franchise	3				
Truro Sleeper Lounge - New sleeper lounge with toilets and showers. Dedicated sleeper car park space.	Improved customer experience for sleeper passengers.	Franchise/LA		1			
St Erth P+R-Redevelopment of station with widened bay platform, car park extension, new ticket office and footbridge.	Improved customer experience, reduced pedestrian congestion and improved reliability for St Ives services. New P+R role for St Ives through 450 additional parking spaces. Step free access between platforms.	Franchise/LA	2	6			

Penzance Sleeper Lounge, New sleeper lounge with toilets and showers	Improved customer experience for sleeper passengers	Franchise/ LA		1.3			
Plymouth Gateway Phase A- First stage of redevelopment of front of station including new MSCP.	300 additional parking spaces.	Network Rail/ LA			10	10	
Paignton station masterplan - Enhancement of station as key part of adopted 'Paignton Refresh' masterplan proposals. Forming part of a multi-model package to link with bus station. Public realm interventions to improve the point of arrival and connectivity between the town centre and seafront. Release of land for residential and commercial development.	Package of economic and transport measures aimed at delivering regeneration and economic recovery. Improved point of arrival, customer experience and links to onward journeys. Improved pedestrian, cycle, bus and vehicular access. Provision of town centre housing and commercial units.	Local Authority	1.7			5	
Bedwyn turnback- Extension of Bedwyn turnback siding	Enables the continuation of through Paddington to Bedwyn services	Network Rail	1.1				
Penzance Depot Improvements *****, Upgrade of Penzance depot to accommodate sleeper rolling stock and additional trains	Enables sleeper upgrade and introduction of Cornish mainline service improvements	Network Rail/ LA	10	14			
Exeter Depot Redevelopment ***, Upgrade of Exeter Depot with new light and heavy maintenance sheds, extra stabling and dedicated train crew accommodation	Enables DMU cascade through enhanced facilities to cater for the large increase in the rolling stock fleet maintained at Exeter depot which will provide improved customer experience and additional capacity across the west. New train crew accommodation enables Exeter St Davids Gateway development	Network Rail/ GWR	53				
Totals			82.6	47.8	10.5	15	155.9
<b>Medium Term Strategy 2020-2024</b>							
Devon Metro Phase 2- Extension of Barnstaple services to Honiton or Axminster.	Improved service frequency and additional capacity from Exeter and East Devon growth area into Exeter.	Franchise					
Dartmoor Northern Route services Phase 1A. Operation of hourly Plymouth to Tavistock services with connecting services to Gunnislake.	Restores passenger service to poorly connected market town providing relief to congestion on one of the main roads into Plymouth.	LA/ Franchise	See PRTF strategic outputs				

Elizabeth Line opening-New railway across London linking Paddington with the City and Docklands.	Improved connectivity to City and Docklands with high frequency services from Paddington providing dramatic journey time reductions for travel to the City and Docklands (see note 1). Improved customer experience through high frequency Elizabeth line services and world class interchange at Paddington Crossrail station.	Industry					
West of England Contingency Plan Planned arrangements in case of weather disruption and to support the delivery of the long term enhancement programme. Includes standing rail replacement plan combined with improved facilities and pre-planned arrangements at stations.	Improved customer experience during periods of disruption due to weather or enhancement works. Enables cost efficient delivery of enhancements by facilitating major line blockages to complete works.	Franchise					
Replacement of local rolling stock - Replace with new fit for purpose and compliant with regulations.	Replacement of oldest rolling stock in UK, improve performance, compliance and the customer experience.	Franchise					
Plymouth Gateway Phase B - Redevelopment of front of station.....	Regeneration of surrounding area. Improved customer experience in concourse and interchange. Improved pedestrian and cycle access.	Network Rail/ LA				15	
Westbury Car Park** Redevelopment of front of station including improved interchange and additional parking.	100 additional parking spaces. Improved customer experience and safety through improved interchange. Improved pedestrian and cycle access from new developments.	GWR franchise			1		
Castle Cary Car Park Phase B**Construction of new car park and entrance to the station and improvements to interchange arrangements.	200 additional parking spaces. Improved customer experience through improved interchange.	GWR franchise			2		
**Exeter St Davids Concourse Phase B - Relocated ticket office, gateline widening and station entrance improvement.	Improved customer experience and reduced pedestrian congestion through improved concourse and new ticket office.	Network Rail/ LA			2		
Newton Abbot Eastern Entrance#. New entrance to station and footbridge extension	Improved pedestrian and cycle access to the station. Improved access to the labour market for neighbouring employers.	LA				4	
Exeter St Davids Gateway- Redevelopment of front of station including new public square and interchange, MSCP, retail and residential/student accommodation.	Regeneration of surrounding area. Improved customer experience in new public square including interchange and retail opportunities. 300 additional parking spaces. Improved pedestrian and cycle access.	Network Rail/ LA			10	5	

Exmouth junction enhanced renewal ***** Renewal of Exmouth junction with double lead arrangement and section of double track on Exmouth branch.	Improves service reliability and supports the provision of frequency improvements at a later date.	Network Rail			2		
Totnes to Penzance signalling renewal - Renewal of all signalling between Totnes and Penzance with modern equivalent.	Provides small increase in capacity, improved reliability and potential modest journey time improvements.	Network Rail			118		
Bristol South resignalling and speed enhancements - Renewal of all signalling and line speed enhancements.	Increased capacity and speed improvements.	Network Rail					
Castle Cary to Cogload junction capacity upgrade***** Additional signal sections to increase capacity by reducing headways.	Improved service reliability.	Network Rail			10		
Total 2019-2024					145	24	169
Medium Term Strategy 2024-2029							
Continued development of local station and services to meet the needs of the South West peninsula.	Improvements in connectivity and economic growth of the region.						
Long Term Strategy 2029 +							
Continued development of local station and services to meet the needs of the South West peninsula.	Improvements in connectivity and economic growth of the region.						
Short Term strategy	2017-2019		82.6	47.8	10.5	15	155.9
Medium Term strategy	2020-2024				145	24	169
Total							324.9
Notes* Majority of improvements are existing GWR franchise commitments. ** GWR promoted scheme *** NR resilience works funded following 2012 floods. **** GWR franchise commitment to deliver if funding confirmed from NR Depot & Stabling Fund to support DMU cascade. ***** Cornwall Council/LEP funded schemes. ***** Renewal assumed in CP6 as set out in Western Route study. Passive provision assumed within renewal scope ***** Opportunity for enhanced renewal as identified within Western Route Capacity Improvement Programme Castle Cary to Exeter study to improve service reliability by reducing delays to SWT services to Waterloo and provides passive provision for future frequency enhancements. Incremental cost allowance made awaiting NR cost. # DCC promoted scheme							



## 4. Making the case and the benefits

### 4.1. Economic baseline

The economic structure of the South West reflects its geographical location at some distance from major markets and centres of commerce. It continues to have a high reliance on traditional land based and extractive industries, together with tourism, all of which are a function of its natural environment.

The South West peninsula has a smaller share of exports than almost every other part of the UK, and low levels of foreign direct investment. These are key indicators of the fact that the peninsula is one of the most cut off areas of the UK. The overwhelming majority of businesses in the South-West are small, but in the past 5 years there has been a significant increase in the number of enterprises. This is almost entirely due to the start-up of micro-businesses with 5 employees or fewer.

*The ambition is to double the growth in employment over the period to 2030 to deliver an additional 201,000 full time jobs across the peninsula.*

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Such transformational economic performance is dependent upon radical improvement in transport connectivity, including the rail service improvements which are set out in this 20 year strategy.

*This growth in employment would be matched by acceleration in the delivery of housing, to provide 231,500 additional dwellings by 2030.*

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Infrastructure improvements to our rail system will improve connectivity, allowing transformational economic performance, through areas such as education and improved skills levels. In addition to the wider economic impact of infrastructure investment a conventional transport assessment has been conducted in order to quantify the benefits which would be delivered by improved services.

### 4.2. Economic benefits of journey time improvements

The Local Enterprise Partnership commissioned a study of the three proposed improvements to the South West rail network. These are:

- London Paddington to Penzance re-signalling and operational improvements;
- Exeter to Waterloo infrastructure improvements; and
- Provision of diversionary route between London and South West via (Yeovil and Castle Cary) during flooding of Somerset and Cowley Bridge.

The appraisal methodology is WebTAG compliant. Journey time savings and service alterations have been reflected in MOIRA to assess the impact of new timetables.

*The direct transport benefits of investing in speeding up services on the Great Western route to Paddington has been assessed as £1.14bn over 60 years, and the direct benefits of speeding up services on the South Western route to Waterloo has been assessed as £677m over 60 years.<sup>21</sup>*

The study focused on quantifying the economic benefits of each scheme and these are shown in the following sections;

#### **4.2.1. London to Penzance economic benefits of reduced journey times**

The basis for this assessment is the reduced journey times along the London Paddington – Penzance route as set out in the PRTF Interim Report of October 2015. This assumed two elements of journey time reduction:

- Signalling improvements; and
- Timetabling and station dwell improvements.

The 20 Year Plan Interim Report has a headline journey time saving reduction of 26 minutes on the journey between Paddington and Penzance. This is made up of 12 minutes related to line speed improvements and 14 minutes related to the operation of the new train fleet (timetable patterns and shorter dwell times with automatic door closing).

Route section	Journey time reduction due to line speed improvement	Journey time reduction due to timetable pattern and train/ and station dwell improvement	Total reduction over this route section
Penzance to Truro	3	8	11
Truro to Plymouth	1	1	2
Plymouth to Exeter	3	2	5
Exeter to Taunton	1	1	2
Taunton to Reading	4	2	6
Reading to Paddington	0	0	0
<b>Total</b>	<b>12</b>	<b>14</b>	<b>26</b>

<sup>21</sup> Heart of the South West Study- Economic appraisal of rail network upgrade proposals May 2016

Table 5. London Paddington-Penzance proposed journey time reductions

For these assessments the industry standard MOIRA model has been used to give WebTag compliant results.

The MOIRA weekday, Saturday and Sunday timetables were extracted and edited to give all trains running between Penzance and London Paddington the journey time benefits detailed in the table above.

Upon submission of the revised timetables, the new timetable was compared against the base (existing) timetable, and the following was extracted from MOIRA:-

- Journey Benefits by Station
- Revenue Benefits by Station; and
- Value of Time and Passenger Miles Benefits by Origin-Destination and Journey Purpose.

Using a bespoke appraisal model, the following benefits were derived:-

- Revenue (fare) benefit to the rail network
- Rail user perceived journey time benefits
- Non user benefits arising from road decongestion
- Non user benefits arising from accidents, noise and air quality reductions
- Disbenefit from indirect taxation;

These wider GVA benefits were determined using outputs from MOIRA. Only flows directly impacted by the proposals were included.

Research from Visit England was used to establish the base line tourist flows between the South West and London/ South East and to give an indication of the average spend per trip.

These wider GVA benefits are based on the findings of the “Productivity and Wider Economic Impact” study carried out by WSP/ Parsons Brinckerhoff in 2015.

A key underpinning statistic in the report is that productivity reduces by up to 6% for every 100 minutes journey time from London.

The assessment calculated the impact of reduced journey times between London Paddington and the principal stations in the South West peninsula west of Taunton. Based on the journey time reductions shown in the section above, the productivity gains range from 0.4% in Somerset to 1.1% in Cornwall. The resulting direct transport benefits and wider economic benefits are summarised in the table below.

Benefits	Appraisal Benefits	
	10 Years (£m)	60 Years (£m)
<b>DIRECT BENEFITS</b>		
1. Rail User perceived Journey Time benefits (new & existing users)	£80.7	£751.8
2. Non user benefits – road decongestion	£7.5	£86.2
3. Non user benefits – noise, air quality, etc	£2.2	£20.7
4. Total Revenue benefit	£41.2	£299.9
5. Indirect Taxation	-£3.3	-£23.2
<b>Total Direct Benefits</b>	<b>£128.3</b>	<b>£1,135.4</b>
<b>INDIRECT BENEFITS</b>		
6. Impact of Increased Leisure Trips in South West	£105.9	£629.6
7. Impact of Increased Productivity in South West	£1,108.8	£6,588.7
7a. Somerset	£163.7	£972.7
7b. Devon	£310.3	£1,843.8
7c. Torbay	£53.9	£320.1
7d. Plymouth	£184.3	£1,095.4
7e. Cornwall	£396.6	£2,356.8
<b>Total Indirect Benefits</b>	<b>£1,214.7</b>	<b>£7,218.3</b>

Table 6. London Paddington-Penzance Improvements Summary of Benefits<sup>22</sup>

#### 4.2.2. London Waterloo to Exeter economic benefits of reduced journey times

The West of England Line is the route from London Waterloo via Basingstoke and Salisbury to Yeovil Junction and Exeter. It is part of the South Western franchise.

Currently the basic service between Waterloo and Exeter is one train per hour and in some hours there is a second train as far as Yeovil Junction. There are two trains per hour between Waterloo and Salisbury.

West of Salisbury the majority of the route is single track, having been downgraded from a double track main line in the late 1960s after the Beeching report. The long single track sections are a significant constraint on the operation of the train service, limiting both the number of trains which can be operated and the speed at which they can run.

As a consequence, journey times between Exeter and London via this route are over three hours, which is up to an hour longer than the alternative Great Western Route to London Paddington.

<sup>22</sup> Heart of the South West Study- Economic appraisal of rail network upgrade proposals May 2016

It has become clear that it would be possible to operate a significantly enhanced pattern of services if some of the constraints imposed by the existing infrastructure were overcome.

Significantly reduced journey times to/from places west and south of Yeovil could be achieved if some trains were able to run non-stop between Salisbury and Yeovil. In addition to faster journey times achieved by a revised calling pattern at stations, the PTRF strategy includes provision for increases in line speed to 90mph where possible.

The journey improvement figures below reflect the initial views of the current train operator, South West Trains. The sectional journey time reductions are shown in the table below

Route Section	Journey time reduction due to line speed improvement	Journey time reduction due to timetable pattern with Exeter trains running non-stop between Yeovil and Salisbury, and between Salisbury and Clapham junction	Total reduction over this route section
Exeter to Yeovil Jun	-	-	-
Yeovil Jun to Salisbury	4	20	24
Salisbury to Waterloo	2	10	12
Total	6	30	36

Table 7. London Waterloo-Exeter Improvements Summary of Benefits

The MOIRA weekday timetable was extracted and edited to give all trains running between Exeter and London Waterloo the journey time benefits detailed in the table above.

Upon submission of the revised timetables, the new timetable was compared against the base (existing) timetable, and the following was extracted from MOIRA:

- Journey Benefits by Station;
- Revenue Benefits by Station; and
- Value of Time and Passenger Miles Benefits by Origin-Destination and Journey Purpose.

Using a bespoke appraisal model, the following benefits were derived:-

- Revenue (fare) benefit to the rail network
- Rail user perceived journey time benefits
- Non user benefits arising from road decongestion
- Non user benefits arising from accidents, noise and air quality reductions
- Disbenefit from indirect taxation

The resulting annual benefit is shown in the table below.

<b>Benefits</b>	<b>Appraisal Benefits</b>	
	10 Years (£m)	60 Years (£m)
<b>DIRECT BENEFITS</b>		
1. Rail User Perceived Journey Time benefits (new & existing users)	£90.9	£504.1
2. Non user benefits – road decongestion	£6.6	£40.8
3. Non user benefits – noise, air quality, etc	£1.7	£9.7
4. Total Revenue benefit	£30.4	£133.7
5. Indirect Taxation	-£2.2	-£10.6
<b>Total Direct Benefits</b>	<b>£127.4</b>	<b>£677.6</b>

Table 8. London Waterloo-Exeter Improvements Summary of Benefits<sup>23</sup>

#### **4.2.3. Economic Impact of improving resilience by upgrading the route between Exeter, Yeovil Junction and Castle Cary**

The third element of infrastructure improvement considered in the economic study was improvement of the capacity of the route from Exeter St David's to Yeovil Junction and Castle Cary.

The extreme rainfall and storms in the winters of 2012/13 and 2013/14 highlighted the vulnerability of the Western Route between Exeter and Paddington to closure due to weather related incidents. A number of the sections of route are vulnerable to flooding, including Cowley Bridge, Exeter, Hele and Bradninch, and the Somerset levels between Cogload and Athelnay.

This improvement between Exeter, Yeovil Junction and Castle Cary, which is described more fully in section 6.2, would enable a diverted Great Western train path in each direction per hour, in addition to the planned services on the South Western between Exeter and Waterloo, and Exeter and Axminster. The improvements between Exeter and Honiton are a central part of the plan to achieve a half hourly frequency between Exeter and Honiton / Axminster through the East of Exeter growth area.

In the assessment shown in table 9, flooding was assumed to impact the Great Western services for up to one week per year. The assessed benefit is for maintaining an hourly service using the diversion route, rather than terminating Great Western services to the South West peninsula from Paddington at Taunton.

<sup>23</sup> Heart of the South West Study- Economic appraisal of rail network upgrade proposals May 2016



<b>Benefits</b>	<b>Appraisal Benefits</b>	
	<b>10 Years (£m)</b>	<b>60 Years (£m)</b>
<b>DIRECT BENEFITS</b>		
1. Rail User Perceived Journey Time benefits (new & existing users)	£16.9	£103.9
2. Total Revenue benefit	£6.4	£31.1
<b>Total Direct Benefits</b>	<b>£23.3</b>	<b>£135</b>

Table 9. London-South West Diversionary Route Summary of benefits<sup>24</sup>

### 4.3. Business

Understanding the needs of business are key to driving economic performance within the region and therefore a business survey was conducted in order to assess the extent of dependence on rail services of the business sector in the South West peninsula, and to gauge reactions to the priorities of the emerging PRTF strategy.

The survey achieved wide coverage, with 293 responses from across the peninsula, from Somerset to Cornwall.

Responses were received from businesses both large and small:-

- 109 responses from businesses with over 50 employees
- 33 responses from businesses with between 21 and 50 employees
- 121 responses from businesses with 20 employees or fewer

The survey also attracted responses from business organisations such as chambers of commerce, which together represent over 23,000 businesses.

#### 4.3.1. The importance of Rail to South West peninsula businesses?

- Over 75% of those responding said that rail is important for their business. This is for a number of reasons, depending on the circumstances and location of each business.
- Over 87% of respondents said that rail is used by their staff for business travel.
- Over 53% said that rail travel is used by their suppliers.
- Some 36% said that rail is used by their staff for commuting.

<sup>24</sup> Heart of the South West Study- Economic appraisal of rail network upgrade proposals May 2016

*87% of respondents said rail is used by staff for business travel*

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#### **4.3.2. What connectivity is important for South West peninsula businesses?**

Rail services provide connectivity from the South West to a number of destinations.

- Over 91% of respondents said that rail travel to London and the South East is important for their business.
- Over 80% of respondents said that rail travel to Bristol and the Midlands/ North is important for their business.
- Some 60% of responses indicated that connectivity by rail to international airports is important for their business.
- Almost 69% of respondents said that rail travel within the South West is important for their business.

*Over 91% of respondents said rail travel to London is important to their business*

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#### **4.3.3. Priorities for businesses?**

The three main themes of the PRTF rail strategy are:-

- Resilience of the rail network
- Reductions in journey times by rail
- Trains which provide greater capacity and comfort

In the survey respondents were asked to rank the importance to them of these three themes.

- Almost 47% of respondents stated that resilience was their top priority.
- Over 43% of respondents said that improved journey times were their top priority.
- Just under 10% placed the capacity and comfort of trains as their top priority.

#### **4.3.4. Aspects of rail services?**

When considering the connectivity provided by rail services there are a number of attributes that, when taken together, influence the decision whether to use rail or an alternative mode of transport.

The rail strategy offers the opportunity to improve the offer of rail across these attributes. The survey asked respondents to indicate the importance of each, on a 1 to 5 scale, with results as shown in the table below.

Aspect of rail travel	Importance from 1 (not very important) to 5 (very important)				
	1	2	3	4	5
Access to rail services	10%	5%	10%	18%	56%
Rail journey time	9%	5%	11%	24%	51%
Frequency of services	7%	6%	7%	41%	39%
Capacity (ease of getting a seat)	4%	8%	19%	37%	31%
Reliability (running on time)	8%	5%	6%	22%	58%
Quality of travel environment	3%	9%	27%	45%	16%
Price of journeys	5%	6%	16%	33%	40%
Wi-Fi/ mobile phone connectivity	7%	9%	16%	28%	39%

Table 10. Business case survey results for aspects of rail travel

The responses above suggest that the ability to access rail services, the journey time and reliability are the attributes which potential passengers value most highly, and that they may be prepared for less than ideal conditions while on board a train if the service is reliable and meets their needs.

#### 4.3.5. The impact of journey time reductions?

The Economic Impact study for the PRTF rail strategy has quantified the scale of benefits that would be delivered by reductions in rail journey times. These benefits have been measured in terms of conventional transport economics (comprised of reduced travel time, and decongestion of highway networks through transfer of mode) and also the wider economic benefit resulting from improved connectivity.

In order to validate the assessment that improved rail journey times would lead to significant wider economic benefits the survey asked respondents about the expected impact on their business of reductions in the journey time to London. Their responses are shown in the table below:

Reduction in journey time to London	Expected impact on business of the journey time reduction				
	No expected impact	Minor impact	Moderate impact	Significant impact	Major impact
15 mins	55%	27%	17%	1%	0%
30 mins	24%	32%	30%	13%	1%
45 mins	12%	16%	31%	29%	11%
60 mins	10%	7%	15%	30%	38%

Table 11. Expected impact on business of journey time reduction

*Business in the South West peninsula has said that a 45 minute reduction in journey times to London would have a significant beneficial impact on their businesses*

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#### **4.4. Key Findings**

1. Data from 2014 puts the South West average workplace gross value added per head at £22,300, compared with a UK average of £24,600 - but for the South West peninsula the range was between £20,150 and £15,500.
2. The view that emerges of the South West peninsula is an area with skilled workers, innovative businesses and resilient productivity. However, it is also in which not all business opportunities are captured and which is poorly related to other communities in the area and to national and international markets.
3. The South West peninsula is considered by some to be an unattractive place to do business. This is due to: poor access, prolonged journeys, increased cost of transport leading to uncompetitive pricing or reduced margins, disruption due to lack of resilience in communications networks and difficulties in recruiting key personnel because of extended travel. If these communications deficiencies can be addressed, then the productive energy of the South West peninsula can be released.
4. The wider economic impact from journey time improvements to London ranging from a 6 minute reduction to Taunton to a 26 minute reduction to Penzance is estimated as generating growth in GVA of around £213m per annum (2011 values), or £7.2bn over a 60 year period; productivity declines by 6% for every 100 minutes journey time from the capital (UWE and Bath University 2005).

<b>Proposal</b>	<b>Total Estimated Benefit (£m)</b>	
	<b>10 Years</b>	<b>60 Years</b>
London Paddington – Penzance (Direct Benefits)	£128.3	£1,135.4
London Paddington – Penzance (Indirect Benefits)	£1,214.7	£7,218.3
London Waterloo – Exeter	£127.4	£677.6
London Paddington – Penzance Diversionary Route	£23.3	£135.0

Figure 3. Summary of Appraised Benefits arising from rail routes

5. In addition to the wider economic impact of increased connectivity to markets in London and the South East, for example, there is one particular sector of the South West economy where the relationship is reversed – tourism. In this case, reduced journey times will make the South West peninsula a more accessible location.
6. Information from Visit England showed that in 2014 some 14.7m domestic tourism trips were made to the South West from London and 25.6m trips were made to London from the South West. The average domestic tourism expenditure per trip to the South West was £285 and is worth £8.63bn a year to the South West economy.

## 5. Funding

Since 2000, over £68m has been invested by the PRTF local authorities to improve the rail network including opening new stations, funding track improvements and enhancing train services, all of which matches our agenda of improving the connectivity of the region and enabling economic growth.

Historically, central government investment in the South West's transport infrastructure is the lowest of any region in the UK at £193/head compared to a regional average of £276/per head, and just £35/head for railways, compared to a regional average of £97/head.<sup>25</sup>

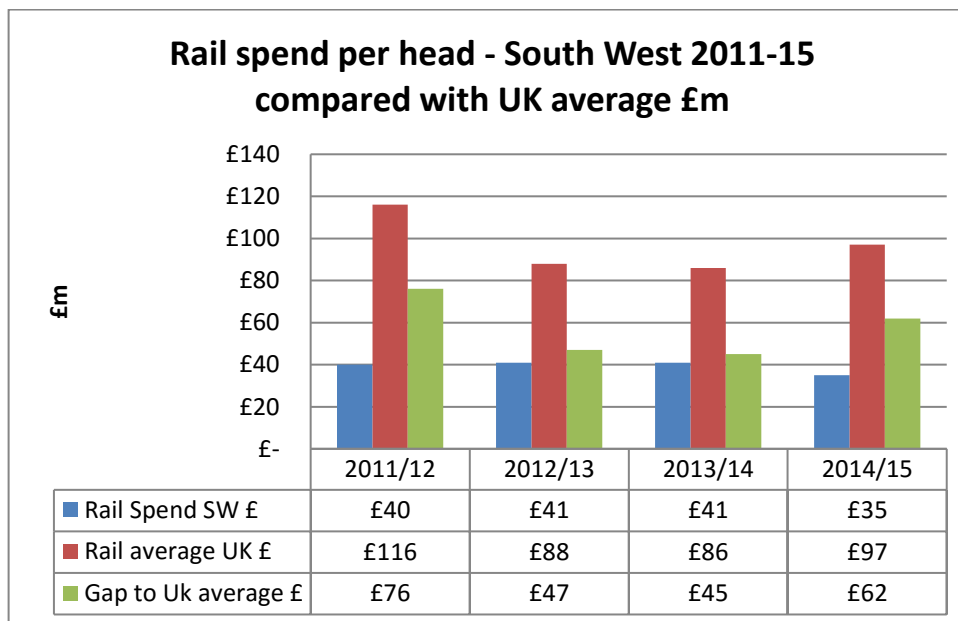


Figure 4. Graph showing the shortfall in regional rail spending over the last 4 years

<sup>25</sup> Public expenditure by county and substructure tables- chapter 10 [www.gov.uk](http://www.gov.uk)

The cumulative effect of the reduced spend against the regional average is £126,500,000 per year, extrapolated over 20 years this equates to £2,530,000,000 not spent on rail in the South West. It can be argued that this is the amount not spent over the last 20 years, and equally what we should receive additionally over the next 20 years.

*If the South West received the average regional spend on rail for the next 30 years, the required improvements to infrastructure and journey times would be funded and achievable*

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Our LEPs are working with Government to achieve the proposals set out in their Strategic Economic Plans, while through the £170m from the growth deals we are investing in aspects of the rail network. Devolution offers potential for combined approaches with partners to deliver improvements. Network Rail (NR) and the train operating companies are working with us to develop and improve their services and we are keen that this continues with no reduction in commitment in future franchises and control periods.

PRTF recognises that funding will form a major consideration in delivering our recommendations and is therefore seeking to explore a wide range of options with the Government which could include;

- Network Rail Control Period funding
- Savings to Network Rail's maintenance costs as a result of enhancements
- Future Growth Deal submissions
- Public/Private partnerships (including a long term concession covering enhancements, maintenance and operation).
- Franchise improvements including route upgrades
- Earn back deals to share in the economic growth benefits
- Maximisation of outputs from work sites to increase productivity and reduce costs

*The support of the Department of Transport, the Treasury and the Department for Business Innovation and Skills are all key to taking forward our ambitions.*

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## 6. Outputs from Studies

### 6.1. Resilience

#### 6.1.1. East of Exeter resilience



Throughout November and December 2012 and then again during the winter of 2013/14 the South West of England was subjected to record levels of rainfall over a prolonged period leading to wide spread flooding. These major events exposed the fragility of the transport infrastructure across the South West and highlighted the limited strategic route options into and out of the South West of England. The flooding caused widespread disruption, damaged businesses and properties and resulted in significant cost to the local economy. Whilst the weather events of 2012 and 2013/14 were particularly severe subsequent resilience studies of the route revealed that many of the same sites had been affected in previous years.

As a result of the flooding related disruption over the last few years the PRTF commissioned a number of studies looking at resilience, journey times and capacity, of which this study is one of those reports.

This report is specifically concerned with the resilience of the railway network between Exeter St Davids and London Paddington with particular focus on the line between Exeter and Castle Cary.

### **6.1.2. East of Exeter study Key Findings**

1. The rail industry identified the impact of the disruption between Exeter and Westbury as £5.15m for the winter of 2011/12 based on Schedule 8 delay compensation payments. In addition, over £3m was spent on remedial works. The direct costs to NR of the 2013/14 events were estimated at £4m of immediate repairs and £13m in compensation costs.
2. In September 2014 NR produced a Western Route Resilience and Climate Change Adaptation Plan to 'articulate Western Route's strategic objectives to manage and mitigate the effects of extreme weather and climate change'. This report included a weather impact assessment which analysed the root causes for disruption and set out the direct financial cost to NR of these disruptions. The analysis (Figure 5) showed that between 2006 and 2014 flooding was 'by far the greatest source of disruption on the Western Route'. Average Schedule 8 payments amounting to £4.3m per year were attributed to flooding events. The third most disruptive type of event is earthslip (generally associated with high rainfall and flooding) resulting in an average of £0.9m per year of compensation events.

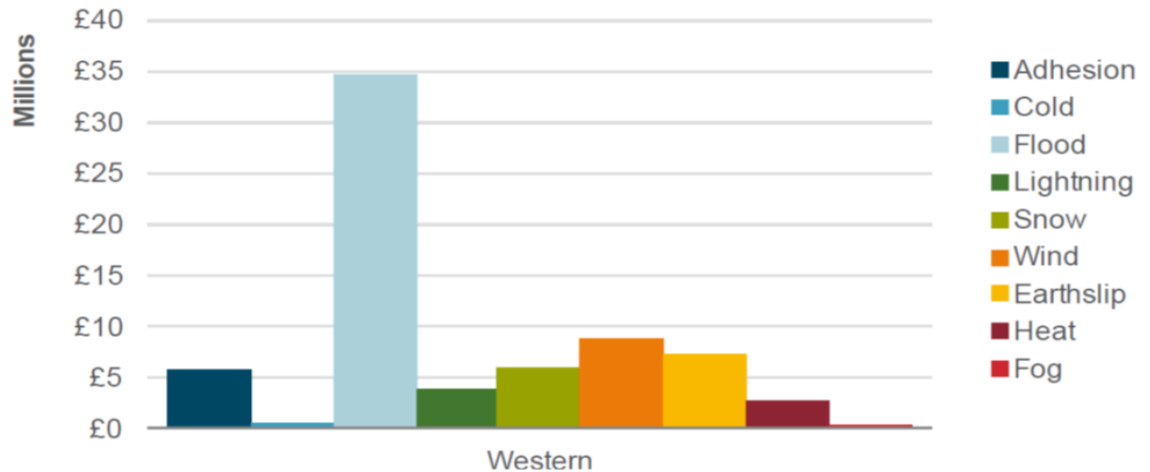


Figure 5 Western Route weather attributed Schedule 8 costs 2006/07-2013/14

- The areas most affected by the floods of 2013/4 were in large part the same areas that were identified as being most susceptible following the 2012 flooding events. The primary impacts to the rail network were felt in the Northmoor and Currymoor areas of the Somerset Levels & Moors. Contained within these moors is the Athelney to Cogload section of the London to Penzance line. It was the extended duration and the depth of the flooding which caused such major disruption and ultimately had a severely negative impact on the economy and reputation of Somerset and the wider South West peninsula.
- Between 2012 and 2014 a great deal of analysis has been undertaken to understand the railway locations most at risk. The table below summarises the key issues east of Exeter and across the Somerset Levels and Moors.

	Pluvial	Groundwa	Fluvial	Estuarine	2013/14	2012	Other Occurrence	Intervention Plan	Intervention Date
Flax Bourton	✓					✓		Drainage Upgrade	Complete
Whiteball Cutting	✓					✓	2008 2007	Enhanced and renewed drainage	Complete
Lyng/Curry Road (Athelney – Cogload)	✓			✓	✓ ✓	✓	✓	Crest Drain at Lyng Attenuation pond at Lyng	Complete 2016

								Scour defences to embankment	New Proposal
Fordgate – Cogload				✓	✓	✓		Intervention requirements yet to be defined	
Cowley Bridge Junction and Staffords Bridge			✓			✓		Construction of new flood relief culverts under the railway, removal of three weirs to return river levels to natural base	2018
Hele & Bradninch			✓		✓	✓	Annual	Enable water flow under infrastructure	

Table 12. Railway locations at most risk

- NR has delivered enhancement schemes at Whiteball, Castle Cary, Langport and an initial phase of works at Athelney. Proposals for enhancements at Cowley Bridge, Hele & Bradninch and additional works at Athelney are well developed and should be delivered within the CP5 period. The standard level of protection on a NR flood defence scheme is generally to design for a 1:50 year event, therefore we would seek to ensure that NR provide resilience to the line that is at least comparable with other lines in the country. Once complete resilience at each of these sites will be significantly improved. In addition to these works NR has raised signalling equipment where possible across the route; this will drastically reduce the time it would take to return the railway to operations following a major flooding event.
- The NR schemes listed above address specific problem locations but the flooding of the Somerset Levels and Moors during 2013/14 was of a different magnitude. Major problems were caused by the extent and duration of the flooding and the depth of the water. In order to understand the current and future risk to the resilience of the railway across the Somerset Levels and Moors it is necessary to understand the interrelationship between the interventions which happened during and immediately after the 2013/14 floods and what is planned but has yet to be implemented.
- Work to identify actions which could be undertaken immediately was commissioned and a list of 'no regrets' actions was identified and prioritised for implementation. No regrets are defined as – standalone works unlikely to have a knock on effect elsewhere or become

redundant as a result of future works. None of these actions were explicitly designed to address the flood risk to the railway but many will ultimately help reduce the risk or mitigate the impact.

8. In parallel to completing the immediate 'no regrets' actions the Environment Agency was commissioned to develop a hydrological model of the Somerset Levels and Moors, which could be used to understand the effect of the actions already undertaken plus the long-term, catchment wide actions required to reduce the risk, the impact and the duration of flooding. It has been possible using this model to review the sections of the railway which were significantly affected by the flooding of 2013/14 and assess whether the actions undertaken to date have mitigated against the line flooding in the future. The map below shows the sections of railway which were most affected by the floods in 2013/14:

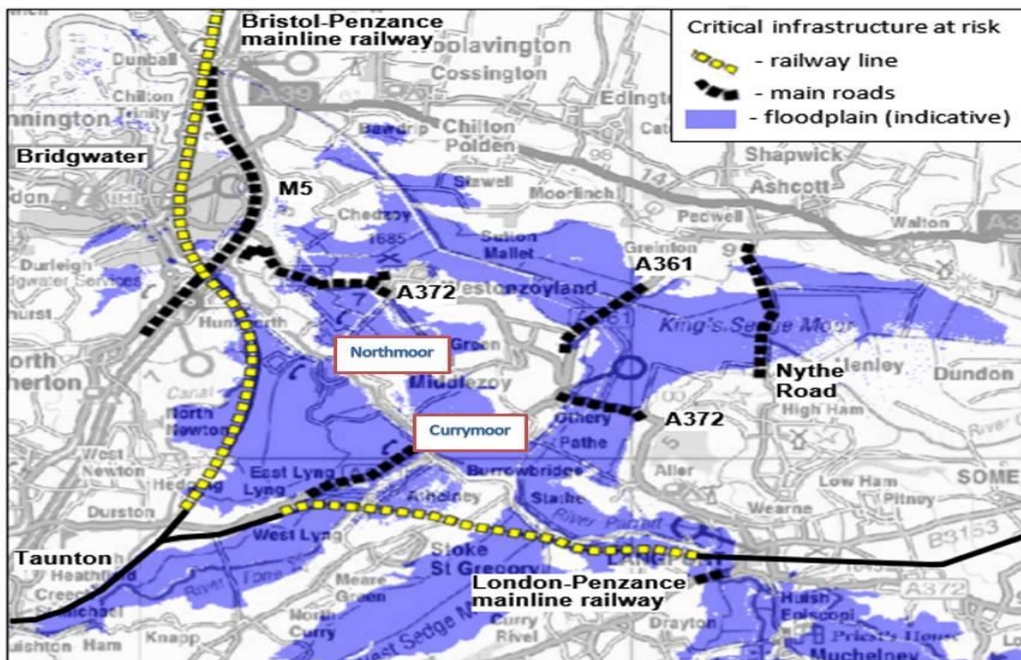


Figure 6. Sections of railway most affected by 2012/13 flooding

9. The modelling showed that the areas of Northmoor and Currymoor continue to be the areas most at risk of flooding. Once the 'no regrets' actions are factored in the model predicts that there is a very low risk of flooding even at the 1:1000 year event. However, the effect on Northmoor and Currymoor could be quite different in the future. The model data shows that across Currymoor the peak flood level is much closer to the minimum level of the railway even at the lowest severity of event. Whereas at Northmoor there is a greater variance between the peak flood level and the minimum level of the railway depending upon the severity of the event.

10. In future Northmoor is less likely to suffer the problems experienced in 2013/14 whilst Currymoor could potentially experience similar issues as it has in the past. The issue across Currymoor was the railway embankment being largely submerged for a long period of time and this being exacerbated by wave action scouring the embankment. NR is currently investigating options for scour protection at this location that once implemented would mitigate against this problem.
11. A major flood mitigation scheme has now been approved for implementation by the Somerset Rivers Authority and the Environment Agency; the 'Sowey / Kings Sedgemoor Drain Phase 3' is an £8.5m scheme. These improvements will allow more water to pass from the River Parrett into the Sowey; this in turn will help to reduce flood flows on the River Parrett in the future and allow the River Tone to discharge more readily. Being able to use the system more flexibly will mean the upstream and downstream pumping stations can be operated earlier, which will benefit communities, infrastructure and land in the Parrett and Tone Moors. For example, studies show that in some locations on the Parrett Moors, the peak floods level could decrease by 0.2 metres and the duration of the flood be cut by up to 10 days. This particular investment should mean that during a similar event to 2013/14 floods the flood water will not sit as high on the railway embankment and the embankment will not be submerged for as long.
12. A great deal of work has been undertaken since the flooding of 2012 and the subsequent flooding in 2013/14. The works which have been undertaken by the Somerset Rivers Authority and the Environment Agency across the Somerset Levels and Moors should have reduced the impact of such an event on the railway and reduce the duration of major disruption in the future.
13. NR has, or is in the process of, implementing several schemes to further address site specific issues. Further analysis is required to understand whether the level of protection at these vulnerable sites will be sufficient to ensure a resilient and reliable railway in the long term, if the frequency and severity of extreme weather events increased as predicted by analysis of climate change.
14. Even with the significant investment that is occurring there is still a risk to the rail network east of Exeter. It is not possible to completely remove this risk, but the work undertaken to date and currently planned will have resulted in significant improvements. A further assessment is needed on the level of risk and disruption that is 'acceptable' against the costs to ensure a resilient and reliable a railway for the South West peninsula.
15. The combination of flooding across the Somerset Levels and Moors and the catastrophic failure of the sea wall at Dawlish resulted in a perception of the South West being 'closed for business'; anecdotally businesses beyond the affected areas reported feedback from customers that they assumed their business was cut off.

16. It was estimated that the direct cost of disruption to the Somerset economy was in the region of £92m and the indirect impact, as measured by GVA, was approximately £13m. Of this between £13m and £21m was attributed to the direct effects of disruption to the railway network. Approximately 22% of the direct impacts of the flooding of the Somerset Levels and Moors were due to the effect on the rail network

### 6.1.3. Dawlish Seawall and cliffs Resilience<sup>26</sup>

The railway through Exeter and Newton Abbot carries direct long-distance train services between the South West peninsula and London, Bristol, Wales, the Midlands, Northern England and Scotland. The line also carries local trains and freight services.

In February 2014, exceptional weather caused the catastrophic destruction of a portion of the Dawlish sea wall and blockage of the line by landslides. Through rail services were suspended for eight weeks, with passengers carried on replacement bus and coach services, affecting the 12,500 rail journeys that are made across this route each day. Freight traffic was transferred to road or loaded at alternative locations.

The final cost to the rail industry of this incident has been assessed at between £40 million and £45 million. This includes the cost of repairs to the infrastructure between Dawlish Warren and Teignmouth, and the compensation payable to passenger and freight train operators, and their customers.

As a result of the events of February 2014, construction of a resilient railway route has been suggested as a means to safeguard train services to and from the South West peninsula. In collaboration with stakeholders, NR has commissioned a high level study to look at sustainable routes between Exeter and Plymouth. This study forms a part of NR's Long Term Planning Process, which proposes options for meeting demand across the rail network over a 30 year timescale.

Critical success factors for a sustainable route include technical feasibility, safe operation and maintenance, resilience against severe weather events, the ability to accommodate forecast demand, value for money and a journey time similar to (or better than) that of today.

***Any resilience study and solution for the route should take into account the wider scenarios and options, i.e. an alternative route with lower cost resilience along the seawall and cliffs.***

This report summarises the findings of NR's high level study. These findings do not commit NR to the construction of an additional route, nor should they be taken to indicate a preference for any particular alignment or solution. The options put forward should be considered in totality

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<sup>26</sup> Network Rail - West of Exeter Route Resilience Study Summer 2014



with other long term outputs required from NR's Western Route study, including improvements to reliability, connectivity, capacity, and journey time.

Appraisal work was commissioned by NR to assess the outline business case for each of the seven potential diversionary routes described in the previous section.

The scope of this appraisal activity can be summarised as follows:

1. To establish a base case, the existing railway via Dawlish would remain the only rail route between Plymouth and Exeter as now. This base case also includes review of the extent to which the Dawlish route could be expected not to be available for traffic due to planned engineering possessions and unplanned disruption, and the road replacement services to be assumed
2. To identify the scale of disruption compensation costs for the base case, which potentially could be avoided, were an alternative/diversionary route to be available
3. To devise appropriate train service specifications for each route option, taking advantage of the new route:
  - a. For planned train services only where it offers journey time savings compared with the existing route via Dawlish
  - b. For diversions on those occasions when the route via Dawlish is not available for traffic
4. To assess the likely scale of passenger demand and revenue impacts for each option
5. To assess the annual operating costs for each option
6. To prepare an outline UK rail financial business case appraisal and DfT WebTAG compliant transport economic appraisal, including unpriced user and non-user benefits. The appraisal compares the seven alternative/diversionary route options against the base case
7. To test the extent to which stakeholders' aspirational higher train service level scenario would change the appraisal results, together with appropriate sensitivity testing to illustrate the robustness of the results and conclusions.

In all the options, the route via Dawlish is retained with existing calls at the intermediate stations maintained. It is assumed that in the short to medium term works will have been undertaken to the route to ensure comparable standards of resilience to levels of risk similar to the average over the last 40 years. The case for the Northern Route and Dawlish Additional Route (DAL) are covered in section 6.8 of this report.

Following on from these early reports NR have been engaged in undertaking further investigation of the options for future resilience along the coast between Exeter and Plymouth. This work includes the seawall and the cliffs between Exeter and Newton Abbot and is being undertaken to the GRIP 2 level of detail. It is expected that NR will release the results of the work once it is finalised, detailing and consulting on the options available for improved resilience.

*When available the outputs of the current GRIP 2 study being undertaken will be released and consulted upon by NR independently of this report.*



#### 6.1.4. Dawlish seawall and Cliffs resilience study Key Findings<sup>27</sup>

A business case/economic appraisal compliant with DfT WebTAG guidance has been undertaken for each new route option. This has been undertaken on the basis of the full stream of costs, revenues and transport economic benefits arising over the project life, incremental to the base case.

Route	BCR <sup>28</sup>
The Base Case of maintaining the existing railway	n/a
Further strengthening the existing railway	n/a
(Alternative Route A) - L&SWR route	0.14
Alternative Route B) - GWR Teign Valley route	0.29
(Alternative Routes C1) - Alphington to Ware Barton, the most direct route which is mostly in tunnel.	0.08
C2 - Exminster to Ware Barton - a western alignment of which two-thirds runs in tunnel.	0.12
C3 - Exminster to Ware Barton - an easterly alignment that reduces the length of tunnelling	0.13
C4 - Exminster to Bishopsteignton - a more easterly alignment which further reduces the length of new construction.	0.17
C5 - Dawlish Warren to Bishopsteignton - the shortest length of new construction.	0.15

Table 13. BCR assessments by NR for alternative routes between Exeter and Newton Abbot

A range of sensitivity tests were undertaken:

1. An enhanced timetable scenario with nearly twice the number of trains.
2. Reduction of 50 per cent in the capital cost outlay.
3. Increased duration of railway closure following damage.
4. Reduction of 50 per cent in the capital cost outlay, and increase in certain revenue and unpriced benefits of 100 per cent. These tests show that even if certain revenue and unpriced benefits were doubled and the capital outlays halved in combination, the financial business case and transport economic case for all of the additional route options appear to remain significantly negative, with each one still offering poor value for money.

<sup>27</sup> Network Rail - West of Exeter Route Resilience Study Summer 2014

<sup>28</sup> DfT uses the ratio of project benefits and costs (BCR) to assess the schemes. BCR measures the net economic benefits per pound of Government subsidy and is the Value for Money measure used by DfT to assess the economic value of a transport schemes. Schemes with a BCR of greater than 4.0 are deemed to offer very high value for money, whilst schemes with a BCR of less than 1.0 are considered to offer poor value for money.

## 6.2. Exeter to Castle Cary Diversionary route study<sup>29</sup>

Following the publication of the Western Route Study, the Department for Transport remitted NR to develop interventions on the route between Exeter and Castle Cary via Yeovil as part of its Western Capacity Improvement Programme (WCIP). These interventions should accommodate forecast levels of rail demand, particularly the provision of an extra train per hour between Exeter and Axminster plus provision of a sufficiently robust diversionary route between Exeter and Castle Cary via Yeovil Junction (Wessex Route Study, November 2014).



Figure 7. Map of the diversionary route between Exeter and Castle Cary via Yeovil

The project objectives are to provide capacity for an hourly, diverted West of England service to run in either direction, as well as an enhanced Devon Metro service, both fitting around the existing Wessex services.

*The economic case has demonstrated that the diversionary route has a benefit equal to £50m over 30 years<sup>30</sup>*

NR has developed four 'Visions' for how the project objectives can be realised, ranging from the least intrusive option which provides the minimum operational flexibility, through to the most extensive infrastructure works which provide a fully flexible railway for any foreseeable service provision.

- "Vision 1": Lowest Cost - Diverted GWR trains plus Devon Metro Option 2
- "Vision 2": Clock-face Timetable - Diverted GWR trains plus Devon Metro Option 1
- "Vision 3": Enhanced Performance - Diverted GWR trains plus Devon Metro Option 1 plus performance enhancement

<sup>29</sup> Western Capacity improvement programme; Exeter to Castle Cary – Summary April 2016 NR

<sup>30</sup> HoSWLEP study 2016

- “Vision 4”: Greatest Flexibility – Double track railway supporting diverted GWR trains plus various Devon Metro scenarios

*Sufficient capacity needs to be made available to allow the route to serve as a diversionary route for Exeter to London Paddington and to meet the needs of the travel to work area into Exeter*

The following details the works required to deliver each vision, and the service improvements that each offers. The scope of works is to deliver the minimum infrastructure needed to run the diverted West of England services, and fit a Devon Metro service to Axminster around this infrastructure.

The interventions required are detailed below:

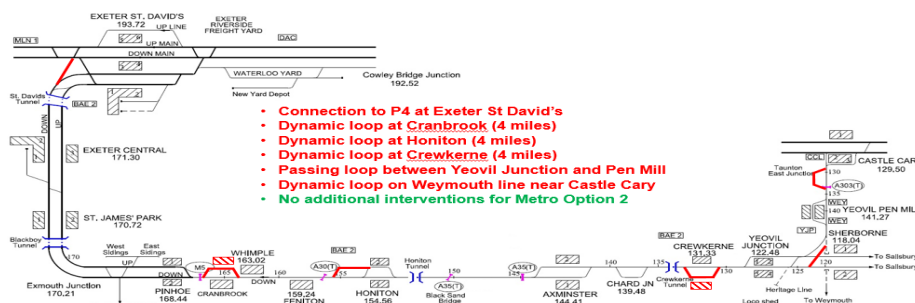
- Connection from the BAE2 to Platform 4 at Exeter St David's
- Dynamic Loop (4 miles) at Cranbrook
- Dynamic Loop (4 miles) at Honiton
- Dynamic Loop (4 miles) at Crewkerne
- Passing loop between Yeovil Pen Mill and Yeovil Junction
- Linespeed improvements at Yeovil Pen Mill – re-signal the mechanical signalling, and replacement turnouts to improve through geometry
- Dynamic Loop (4 miles) between Castle Cary and Yeovil Pen Mill

This infrastructure will allow an hourly service in either direction for the West of England Services. Devon Metro services will run off clock-face, with departures from Exeter at XX50 and Axminster at XX38.

## 6.2.1. Exeter to Castle Cary Diversionary study Key Findings

### **Vision 1 – lowest cost**

**Diverted GWR trains plus Devon Metro Option 2**



## Vision 2 – Clockface service

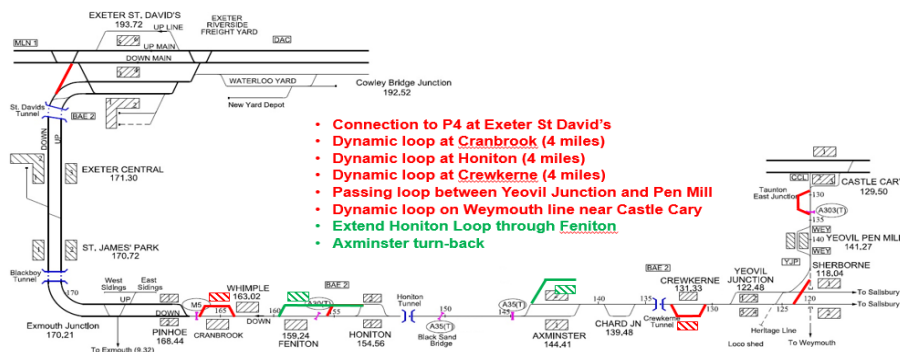
The scope of works for Vision 2 is to provide an even clockface service pattern for the Devon Metro Services to Axminster. Additional infrastructure beyond that required for vision 1 is detailed below:

- Extension of the Honiton Loop as far as Feniton
- Reinstatement of the out of use bay siding at Axminster

This infrastructure will allow the hourly West of England services and clock face departures for the Devon Metro departing Exeter at XX55 and Axminster XX33.

## Vision 2 – clock-face service

Diverted GWR trains plus Devon Metro Option 1



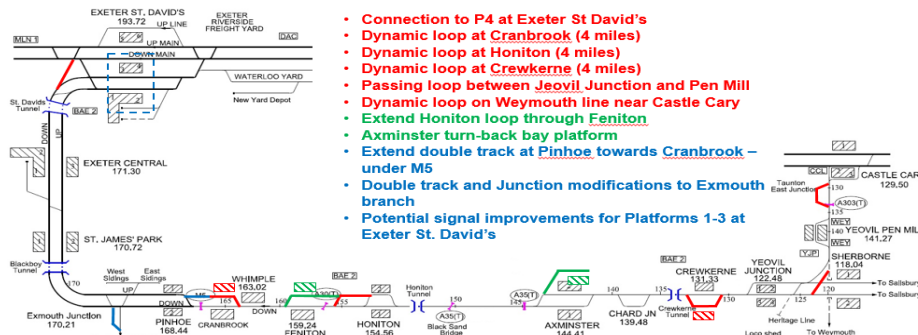
## Vision 3 – Enhanced Performance

The scope of works for this vision builds on the infrastructure provided for Vision 2, and adds in work to achieve train performance improvements at certain constrained areas and where we have identified existing service constraints to exist. The additional infrastructure beyond that required for Vision 2 is detailed below:

- Extend the existing double track at Pinhoe further towards Cranbrook – this would require a new bridge/tunnel under the M5
- Double Track the northern section of the Exmouth branch, including junction improvement works where the Exmouth line joins the BAE2
- Recontrol for platforms 1-3 at Exeter St David's to improve platform flexibility

## Vision 3 – enhanced performance

Diverted GWR trains plus Devon Metro Option 1 plus performance enhancement

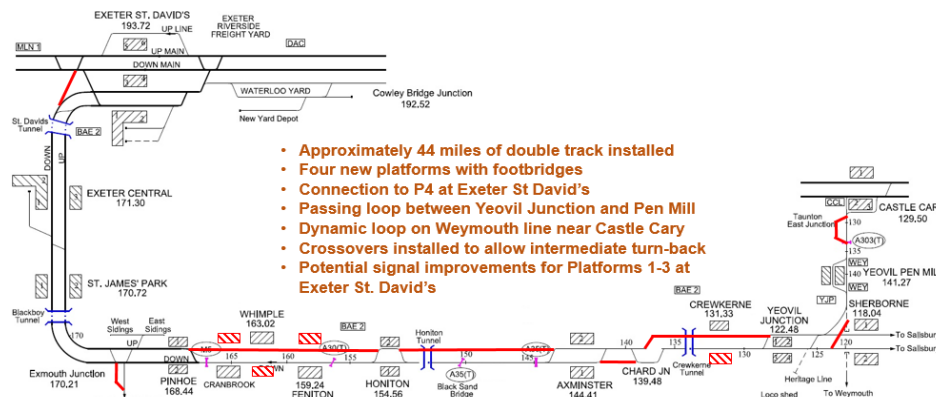


## Vision 4 – Greatest Flexibility

The scope of works for this vision is to achieve the most flexible railway to allow for all future aspirations for services in the region to be accommodated. Ultimately this requires double tracking of the route from Exeter St David's to Castle Cary.

## Vision 4 – greatest flexibility

Double track railway supporting diverted GWR trains plus various Devon metro scenarios



## Vision Analysis;

The analysis of the visions below will be used as a basis for developing a preferred option to take forward to GRIP3 stage. This is likely to be a combination of elements of different options.

Vision	Pros	Cons
I Lowest Cost	Least Cost Shortest Delivery Programme	Least flexible option

	Avoids key constraints, M5 bridge, Honiton & Crewkerne tunnels	Devon Metro service not clock face
2 Clockface service	Least cost option still providing clock face departures Still avoids constraints in VI	Requires potentially complex reworking of Feniton LC and highway, sited on redundant track bed
3 Enhanced performance	Provides improved operational resilience and opportunity for Exmouth services	Costly intervention to double track at M5 bridge Significantly higher costs, potentially small performance improvement
4 Greatest Flexibility	Fully flexible railway to accommodate future growth	High cost, for 28 miles double track, above option 2 Probable track lowering at Honiton and Crewkerne Route studies and stakeholder consultation does not suggest this level of infrastructure required

Table 14. Option analysis

### 6.3. Exeter to Waterloo

The West of England Line is a secondary route into the peninsula from London Waterloo via Basingstoke and Salisbury to Yeovil Junction and Exeter. It is part of the current South Western franchise.

The current service between Waterloo and Exeter is one train per hour and in some hours there is a second train as far as Yeovil Junction. There are two trains per hour between Waterloo and Salisbury.

West of Salisbury the majority of the route is single track, having been downgraded from a double track main line in the late 1960s after the Beeching report. The long single track sections are a significant constraint on the operation of the train service, limiting both the number of trains which can be operated and the speed at which they can run.

As a consequence, journey times between Exeter and London via this route are over three hours, which is up to an hour longer than the alternative Great Western Route to London Paddington.

One of the key aspirations of the Heart of the South West Local Enterprise Partnership (LEP) is to improve strategic connectivity, as a means of reducing the productivity gap between the South West and the more productive economies closer to London. The LEP is therefore seeking faster

journeys by both road and rail, including on the Waterloo to Exeter route.

Such an ambition is shared by the Dorset Local Enterprise Partnership, which is concerned about the length of the journey times between Weymouth and London on the current route via Poole, Bournemouth and Southampton. The Local Enterprise Partnership is therefore exploring the opportunity for enhanced connectivity offered by the option for travel between Weymouth and London via Yeovil and Salisbury.

The two Local Enterprise Partnerships have been working with Devon, Somerset and Dorset County Councils, Wiltshire Council, South Somerset District Council, Network Rail and South West Trains, as part of the West of England Line Group to explore the scope for improved services on the West of England line.

It has become clear that it would be possible to operate a significantly enhanced pattern of services if some of the constraints imposed by the existing infrastructure were overcome.

In particular, significantly reduced journey times to/from places west and south of Yeovil could be achieved if some trains were able to run non-stop between Salisbury and Yeovil. In addition to faster journey times achieved by missing out some station calls, it is understood that increases in line speed should be possible.

The likely impact, in terms of reduction in journey time over the various sections of route, is summarised in table 15:

Route section	Journey time reduction due to line speed improvement	Journey time reduction due to timetable pattern with Exeter trains running non-stop from Yeovil to Salisbury, and Salisbury to Clapham Junction	Total reduction over this route section
Exeter to Yeovil Jn	-	-	-
Yeovil Jn to Salisbury	4 mins	20 mins	24 mins
Salisbury to Waterloo	2 mins	10 mins	12 mins
Total	6 mins	30 mins	36 mins

Table 15

An assessment has been made of the economic impact of such journey time reductions. This work, which is based upon the MOIRA model to give a WebTag compliant assessment, has demonstrated that there would be significant transport economic benefits from journey time reductions. Based upon the above journey time reductions, the 60 year transport economic benefit for these improvements on the Exeter to Waterloo route was assessed as £677m.



There are currently some key infrastructure limitations as a result of the single line sections. The information outlined in table 16 shows the lengths of single track that exists and how it influences the available capacity of the route.

Section of route	Time in minutes	
	Double track	Single track
Yeovil Junction – Sherborne – approach to Templecombe	12	
Templecombe station		2
Templecombe – approach to Gillingham		6
Gillingham station	2	
Gillingham station – approach to Tisbury		8
Tisbury station		2
Tisbury passing loop	1	
Tisbury passing loop - Wilton		11
Wilton - Salisbury	3	
Total	18	29

Table 16 the current use of double and single track sections by time

Assuming evenly spaced departures along the route, the current infrastructure limits the service which can be operated between Yeovil Junction and Salisbury to two trains in one direction and one in the other.

If the aim of the operating pattern were to be for one stopping train and one non-stop between Yeovil and Salisbury, then the non-stop train will nearly have caught up with the stopping by the end of the section of route (stopper 47 mins, fast 27 mins). This could be beneficial, enabling the two trains to join together (say at Salisbury) to run fast from there.

One implication of such an operating pattern, with succeeding trains in one direction being relatively close to each other towards end of the section, is that double track is needed if the two trains plus the headway between them is not to be a major barrier to services in the opposite direction.

In order to understand what is possible a timetable study is required to identify the infrastructure requirements between Salisbury and Yeovil Junction which would enable a train service pattern which meets the aspirations of the West of England line Group.

This timetable study is in addition to the GRIP 2 study that is currently being undertaken by Network Rail in respect of the diversionary route for Great Western services between Exeter,

and Paddington via Yeovil and Castle Cary, together with additional Exeter to Axminster local services.

The aspirations of the West of England Line Group are set out below as three options: -

### **Option 1**

This option seeks to meet the aspirations of faster journeys to/ from Exeter and to/from Weymouth through separate trains between Yeovil and Waterloo<sup>31</sup>

- 1. 1 tph Waterloo to Exeter or beyond (fast Salisbury to Yeovil)
- 2. 1 tph Waterloo to Weymouth (fast Salisbury to Yeovil) reversing at Yeovil Jn (with the option to stop at Gillingham and Sherborne during peak time)
- 3. 1 tph Waterloo to Yeovil Pen Mill, stopping at all stations Salisbury to Yeovil Jn and round to Pen Mill

### **Option 2**

This option seeks to meet the aspirations of faster journeys to/ from Exeter and to/from Weymouth through a joint train between Yeovil and Waterloo<sup>32</sup>

- 1 tph Waterloo to Exeter or beyond (fast Salisbury to Yeovil), splitting at Yeovil Junction with a rear part to Weymouth, joining in the reverse direction
- 1 tph Waterloo to Yeovil Pen Mill, stopping at all stations Salisbury to Yeovil Junction

### **Option 3**

- This option seeks to meet the aspirations of faster journeys to/ from Exeter and to/from Weymouth through separate trains between Yeovil and Waterloo, without increasing the number of train paths between Waterloo and Salisbury<sup>33</sup>  
1 tph Waterloo to Exeter or beyond, splitting at Salisbury with the front part going fast Salisbury to Yeovil and on to Exeter. The rear part calling at all stations from Salisbury to Yeovil Pen Mill.
- 1 tph Waterloo to Weymouth (fast Salisbury to Yeovil) reversing at Yeovil Junction (with the option to stop at Gillingham and Sherborne during peak time)

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<sup>31</sup> Taking note of the following at Yeovil Junction  
1 tph Bristol Temple Meads to Weymouth via Yeovil Junction  
1 tph Paddington to Plymouth via Yeovil Junction (not stopping between Castle Cary & Exeter)  
And all of the above in the reverse direction

<sup>32</sup> As Note 30

<sup>33</sup> As Note 30

## 6.4. Journey Times Improvements

The PRTF is seeking to achieve an improvement in journey times that achieves;

London Paddington to Taunton	1h30m
London Paddington to Exeter	1h45m
London Paddington to Plymouth	2h15m
London Paddington to Truro	3h30m

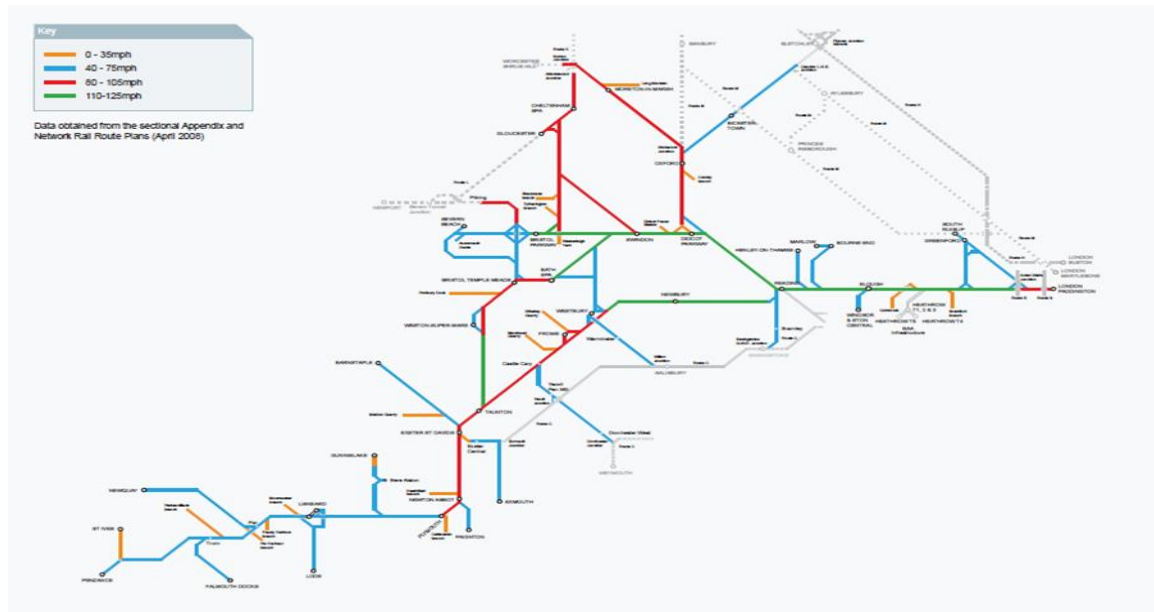
The aim of the journey time improvements studies are to identify which parts of the current rail infrastructure can be upgraded to improve journey times to the South West peninsula to achieve the PRTF journey times shown above.

The studies were divided into 3 parts:

- Part 1: maximisation of the benefits of the AT300 introduction in December 2018/2020;
- Part 2: GRIP 2 study between Westbury and Penzance to inform CP6; and
- Part 3: Pre-GRIP study to close the gap between GRIP 2 outputs and PRTF ask.

In order to achieve the journey times above, an average of 100mph would be required between London and Plymouth, the current average is 69mph.

The network map below demonstrates the average speeds across the rail network to the South West.



Map courtesy of GWR

## 6.5. Journey Time Improvements part 1- maximisation of the benefits from the AT300 trains (2018/2019)

### 6.5.1. Current and proposed journey times

The introduction of the new GWR AT300 trains in December 2018 will bring with them improvements in the journey times to the South West peninsula a result of the faster acceleration, power doors and reduced station dwell times. Based on the Stakeholder briefings that have been conducted by GWR, these improvements will result in the following improvements to journey times:

London Paddington to Exeter	5 minutes
London Paddington to Paignton	6 minutes
London Paddington to Plymouth	6 minutes
London Paddington to Penzance	14 minutes

Table 17 shows the likely impact of these changes on the current fastest journey times:

From	To	HST fastest existing journey time	Anticipated revised journey times with direct award AT300 improvements
London	Taunton	1h42m	1h38m
	Exeter St David's	2h00m	1h55m
	Plymouth	2h59m	2h53m
	Penzance	5h05m	4h51m

Table 17. Existing fastest journeys compared with new AT300 introduction

It is however noted that the introduction of a standard hour pattern may have an impact on the fastest current journey times.

***The rail industry must identify how the benefits of the introduction of the new AT300 trains can be maximised.***

## 6.6. Journey Time Improvements part 2 – GRIP 2 study

The Speed to the West study was commissioned by GWR in February 2016 to identify the potential for journey time improvements on the current infrastructure of the Great Western route between London Paddington and the South West peninsula. The detail in this section summarises the findings of that work.

The study focussed on the potential infrastructure changes to improve line speeds between Southcote Junction (west of Reading), and Totnes via Castle Cary, a distance of approximately 165 miles. In addition, the report also considered improvements that could be made between Totnes and Penzance, based on a previous Network Rail study, in order that the improvements could be seen for the complete route.

It should be noted that significant high speed service improvements will be implemented by the December 2018 timetable as part of GWR's Direct Award franchise. The 2018 timetable has therefore formed the baseline for the Speed to the West study. A core objective to identify measures which will improve headline journey times over and above the December 2018 timetable.

### 6.6.1. The Study brief

Infrastructure improvements have been considered to reduce the journey time from London to Taunton, Exeter, Plymouth, Truro and Penzance by 3, 6, 9, 11 and 12 minutes respectively over and above the fastest Up and Down services in the December 2018 timetable. Baseline journey time and targets are set out in Table 18.

<b>Journey (down)</b>	<b>Today's fastest (HST)</b>	<b>2018 fastest (AT300)</b>	<b>Aspired Reduction (minutes)</b>	<b>Journey time after reduction</b>	<b>45 minute stretch target</b>	<b>PRTF aspiration</b>
Paddington - Taunton	1h42m	1h38m	3 mins	1h35m	55m	1h30m
Paddington – Exeter St Davids	2h00m	1h55m	6 mins	1h49m	1h19m	1h45m
Paddington - Plymouth	2h59m	2h53m	9 mins	2h44m	2h18m	2h15m
Paddington - Penzance	5h05m	4h51m	12 mins	4h39m	4h14m	4h10m

Table 18. Baseline journey times (down direction) and PRTF aspirations within the brief

A key principle for the study was to consider journey time improvements that could be delivered through infrastructure improvements rather than calling patterns. The baseline for journey times includes stops at Reading, Taunton, Exeter St David's, Newton Abbot and Plymouth.

The calling pattern west of Plymouth would be little different to that today, although clearly the two trains an hour pattern on the Cornish mainline provides greater flexibility in how some of the smaller stations (e.g. Saltash and St Germans) might be served. In addition, any improvements

identified west of Taunton that could reduce the journey time of Cross Country and local GWR services were sought through the study.

Network Rail was also tasked to consider, as a stretch objective, improvements above the baseline that would derive a 45 minutes improvement in the end to end journey time.

### **6.6.2. Outcomes from the study**

The study by Network Rail has considered both improvements along the existing rail corridor (within land controlled by Network Rail) and improved alignments that would be outside of the current rail boundary.

Improvements to the existing railway alignment, including re-canting, minor changes to track curvature / radius and work to strengthen bridges are termed 'low interventions'. More radical options such as those requiring land acquisition and creation of new infrastructure are termed 'high interventions'.

The route has been reviewed in sections, with interventions broken down into 'journey time improvement' (JTI) sets containing packages for coherent route sections. Each set has been assessed by journey time saving and cost to enable a comparison of value. All interventions have been developed to an early GRIP stage and will need further work to develop.

High level economic analysis has been undertaken alongside this study to consider wider economic impacts of each Journey Time Improvement (JTI) package, including factors such as socioeconomic value. This has allowed each JTI set to be attributed a score for economic value, ranging from very high to poor.

A range of interventions has been considered, on a scale of complexity and likely funding requirement. Figure 8 describes a menu of options that the work has identified, with cost per minute saved to provide a comparator for business case value.

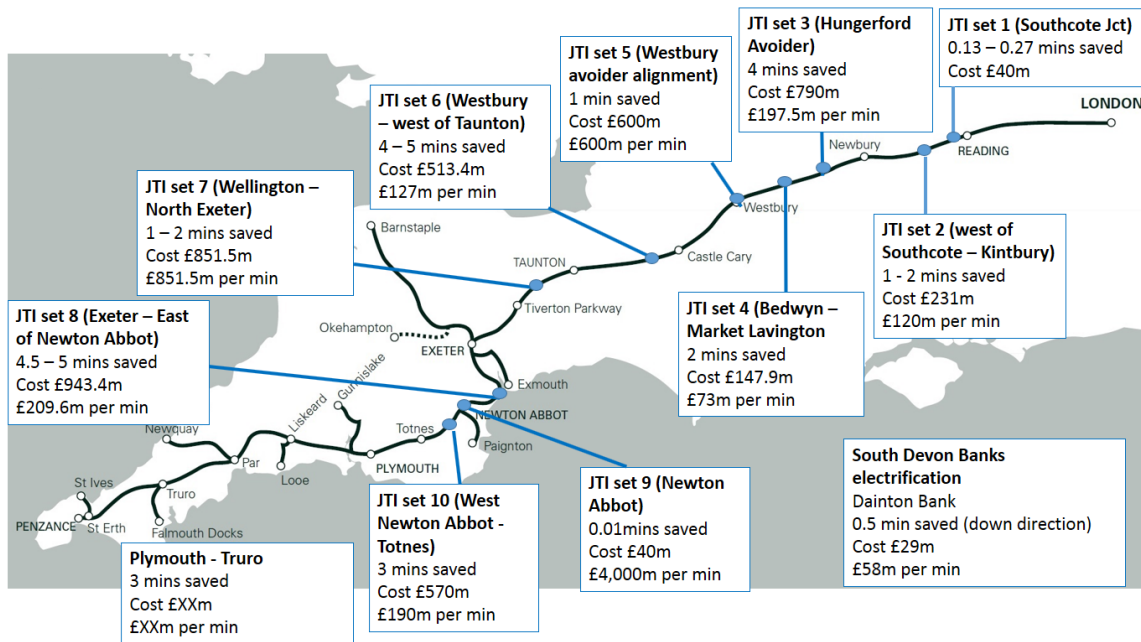


Figure 8. Costed menu of infrastructure options to deliver journey time improvements courtesy of GWR

### 6.6.3. Translating the benefits into the timetable

The reduction in journey times of over 10 - 20 minutes and beyond would prompt a recast of the West of England main line. The new timetable would need to address how the accelerated train paths would fit with other services on high-frequency routes. The sections from Paddington to Reading and Exeter St David's to Newton Abbot are important fixing points. These sections are capacity constrained as they have key inter-relationships with other service types.

One approach would be to fix the Paddington arrival and departure times so that all the changes occurred west of Reading, with earlier paths westbound and later starts eastbound. However, the relationship with Cross Country paths between Bristol and Plymouth will need to be considered. These services could also benefit from higher line speeds west of Taunton, however if conflicts occur then timings on the Paddington to Reading section would need to be revisited. This section is particularly constrained and therefore the ability to capitalise on line speed benefits may depend on the ability to re-structure the Paddington to Reading section or alternatively find a wider industry solution. It is important to note that improvements which also address capacity issues will be critical, to ensure the flight of fast services can be achieved (i.e. by removing conflicts with freight and or slower stopping services).

Another key section of route is Exeter to Newton Abbot. Capturing time savings in this section will depend on the interactions on the mainline, including with the half-hourly Exmouth – Paignton



section. Greater capacity in this section would provide extra flexibility and enable the full benefit of line speed improvements to be obtained.

#### 6.6.4. Assumptions

It should be noted that this report has made a number of high level assumptions in order to develop interventions, prices and journey times. Each will need to be ratified further within the GRIP stages. Key assumptions are:

- *Access for design / construction is granted.*
- *Resource for design/construction/testing is available.*
- *Requisite plant is available (e.g. Kirov).*
- *ETCS not taken into account.*
- *AT300 data has not been used / modelled.*
- *Old Oak Common new station not taken into account.*
- *Planned electrification to Newbury will be complete.*

#### 6.6.5. Summary and next steps

To achieve 3, 6, 9, 11 and 12 minutes quicker from London to Taunton, Exeter, Plymouth, Truro and Penzance will require a mixture of 'low' and 'high' interventions.

Options that appear to offer the best value are those between Reading and Taunton (Southcote Junction to just west of Taunton). These options, costed at approximately £894m, could deliver a saving of between 8 and 9 minutes to/from Plymouth and would appear to have positive business cases.

Further options between Newton Abbot and Totnes could deliver a further 3 minutes saving at a cost of £599m. This includes discreet electrification of the South Devon Banks, which would for example provide a 1 minute saving in the down (to Plymouth) direction.

Further work is required to assess the improvements that could be made between Totnes and Penzance. The initial view is that this could save a further 3 minutes, mostly in the section between Plymouth and Truro.

All work has been undertaken to a pre GRIP level but sufficient to enable a costed menu of measures to be presented. Significant funding will be required to develop each intervention set, alongside the development of the business case including wider benefits. Further assessment of the performance benefits of AT300 trains will be needed to ensure that timetable benefits can translate into 'useable' time savings.

London to Plymouth journey times could be reduced by up to 24 minutes by 2029. These times compare against the 45minute end to end journey time target. The inclusion of the high intervention schemes and the building of the Dawlish additional line (see section 6.10), to increase capacity between Exeter and Newton Abbot would realise an additional 19 minute saving, creating another 27 minutes journey time reduction to Plymouth and west wards.

To achieve the journey time savings shown within the report will involve a mix of high and low interventions costing an estimated £1.5bn in the medium term. Long term cost for the additional 27 minutes shown in this report are purely indicative and subject to change. Whilst this includes interventions which in an initial assessment are judged poor value for money, this is based on the outputs of traditional transport economic appraisal and does not take into account wider economic benefits. It can therefore be concluded that the assessment of wider benefits will be critical to making the case for these intervention sets.

Another core conclusion from the work is that if the PRTF aspirations are to be achieved, further track, new lines and train enhancements would be needed to go beyond 125mph.

### 6.6.6. Journey Time Improvements part 2 Key Findings

As discussed in the previous section, to achieve 3, 6, 9, 11 and 12 minutes quicker from London to Taunton, Exeter, Plymouth, Truro and Penzance will require a mixture of 'low' and 'high' interventions. In other words, some improvements will be required outside the current rail boundary.

The Options that appear to offer the best value are those between Reading and Taunton (Southcote Junction to just west of Taunton). Together the following options, costed at approximately £894m, could deliver a saving of between 8 and 9 minutes to/from Plymouth and further west with most of the benefits being captured east of Taunton.

JTI set	Location	Intervention	Total cost £million	Time saving (mins)		£million / minute (Up)	Value
				Down	Up		
4	West of Great Bedwyn to north of Market Lavington.	A series of low interventions along the existing rail corridor	£149.7m	2.04	2.03	£74m	Very high
2	West of Southcote – Kintbury	A series of high and low interventions. The high interventions are outside the existing railway boundary, but generally follow the existing rail corridor. Additionally, by the time of implementation, this area may require changes.	£231m	1.18	1.92	£120m	Medium

6	West of Westbury – West of Taunton	A series of high and low interventions which generally follow the rail corridor, but with a significant deviation to allow the line to be positioned south of Somerton, and re-joining the existing line prior to Somerton Tunnel. This is likely to require new tunnelling. Re-alignment at Castle Cary	£513.4m	5.34	4.03	£127m	Medium
			<b>£894.1m</b>	<b>8.56</b>	<b>7.98</b>	<b>£112m</b>	

Table 19. Measures /cost offering high benefits for cost

Additionally, measures between Newton Abbot and Plymouth would generate additional journey time benefits. These include measures between Newton Abbot and Totnes returns involving new railway alignments and selective electrification. These are outlined below.

JTI set	Location	Intervention	Total cost £million	Time saving (mins)		£million / minute (Up)	Value
				Down	Up		
10	Newton Abbot to Totnes	A series of high and low interventions. The high interventions are outside the existing railway boundary, but generally follow the existing rail corridor. This set does however require the junction with the line to Buckfastleigh to be remodelled.	£570m	2.67	3.41	£167m	Low
	Electrification of Dainton Bank	Localised electrification of the south Devon banks (assumed on existing track profiles) – not considered within JTI set 10	£29m	0.5	0	£58m (down only)	Very high
	Electrification of Hemerdon and Rattery	Localised electrification of the south Devon banks (assumed on existing track profiles)	TBC	TBC	TBC	TBC	TBC
			<b>£599m</b>	<b>3.17</b>	<b>3.41</b>	<b>£199.6</b>	<b>Low</b>

Table 20. Options between Newton Abbot and Plymouth

Modest sections of electrification on its own would appear to offer a positive business case, allowing better performance by the AT300's over these discrete areas.

Further west a 3 minute journey time saving is possible between Plymouth and Penzance, nearly all of which would be east of Truro. This would involve mainly a set of low interventions to

strengthen viaducts, renew bridges, tunnel widening, improved level crossings and through relocation of signals. It would also include platform modifications and earthwork renewals. Another core conclusion from the work is that if the PRTF aspirations are to be achieved, further track and train enhancements would be needed to go beyond 125mph.

## **6.7. Journey Time Improvements part 3 – Options for closing the gap**

Even if all of the options discussed above were implemented, the journey times achieved may still not meet the PRTF journey time aspirations. Shown below are a number of suggested options on how the gap between the Part 2 report and the PRFT 'Ask' could be bridged.

### **6.7.1. Rolling Stock**

Problem Statement: Current and planned rolling stock cannot achieve the PRTF's journey time improvements.

Potential solutions:

- Tilting trains - to improve the speed trains can travel over a highly canted/ curved track.
- Electric capability - the latest Inter City Express Programme data suggests that this will introduce better acceleration & higher top speed; however, this is not yet proven for the AT300.
- Powerful loco hauling stock, e.g. Class 68 with short rake of carriages, bringing improvements to acceleration and braking.
- Trains designed specifically for the route/ service. Possibly split rolling stock to serve a fast commuter and slower 'tourist' service.

### **6.7.2. Harmonisation of stock to reduce dwell times**

- Door position – wider automatic doors.
- Use different doors for boarding and alighting.
- Speedier boarding for people of reduced mobility (and refreshment trolley or similar) - level access, as used in Canada.
- Position of toilets - prevents people waiting in the vestibule and ensures they are ready to exit quickly.
- Luggage rack locations - having them by the vestibules prevents rapid flow of passengers on and off the train.

### **6.7.3. Calling Patterns**

Problem Statement: Rigid calling patterns inhibit faster journey times.

Potential solutions:

- Removing stations from the journey, for example running non-stop services between London Paddington & Plymouth/Truro/Penzance at certain times of the day.
- Splitting of services, with the split to provide a fast and slower onward service to certain stations.
- Services not stopping at Reading.
- It is also worth noting that Network Rail has been made aware of several new station aspirations along the route in question. Clearly the implementation of these stations could have an adverse effect on journey times if main line services were to call at them, or if stopping services were to prevent high speed services passing. High speed services could get caught behind local stopping services serving the new stations without suitable track layouts such as loops.

#### **6.7.4. Station Design**

Problem Statement: Current design inhibits the possibility of trains exiting stations more quickly.

Potential solutions:

- Remodelling of stations, e.g. Exeter St David's to aid passenger flow.
- Let passengers know where to stand on the platform to get straight onto the right carriage.
- Canopies to spread people along the platform, reducing overcrowding at certain carriages.
- Closing up signals to enable faster platform reoccupation.

#### **6.7.5. Timetabling**

Problem Statement: Current timetable inhibits the potential for journey time improvements.

Potential solutions:

- Better timetabled connections - get off the train and straight onto an onward train or bus. Reduce local Bedwyn - Reading trains or other services which slow down faster services, or only run these at certain times of the day, e.g. off peak. Implementation of passing loops could also solve this problem.
- Review freight operation times.
- Removal of 'padding' in the timetable.

#### **6.7.6. Infrastructure Interventions**

Problem Statement: Current infrastructure does not support minimum journey times.

Potential solutions:

- New railway (High Speed Rail) – new routes or four-tracking on certain sections.
- Any new stations, e.g. Cullompton, Wellington, Somerton, to be built on loops. This would ensure that the impact on services not calling at these stations is mitigated.
- Remodelling of junctions.
- New bridge over the River Tamar.

- Flattening, or tunnelling under, the Devon Banks.
- Implementing flooding resilience along the route.
- Electrifying the whole route would provide for greater acceleration, speed and braking.
- Build dynamic loops to allow faster services to go past slower services.
- Increase line speed (not just at junctions) to over 125mph.
- Close level and foot crossings to allow increased line speed.
- Build new viaducts or strengthen existing to allow higher speeds across them (see image below).
- Raise line speeds to provide consistent speeds.

### 6.7.7. Costs

At a Pre-GRIP stage it is difficult to produce exact costings for the proposed options detailed in this report. We have provided some cost detail for selected options from other schemes that have implemented similar interventions in the interest of providing some granularity and comparison.

New Fleet (Tilting trains)	Quicker point to point journey times	£2.7m – 2012 estimated cost	New Carriage	Virgin Pendolino Class 390
New Fleet (Capacity)	Shorter dwell times	£1.515m – 2016 cost	Train set (9 car)	Crossrail Class 345
New High Speed Railway	Quicker point to point journey times	£30bn	JTI reduction of 35 minutes.	HS2 London - Birmingham
New High Speed Railway (Reading to Taunton)	Quicker point to point journey times	£30bn £23bn	140 miles of new railway (London to Birmingham). 107 miles of new railway (Reading to Taunton)	HS2 London – Birmingham Pro rata from HS2
New Tunnel	Reduces journey times for Devon Banks	£66,300	Per metre for single bore 9.8m internal diameter (construction costs only)	HS2
Electrification (new OLE equipment only)	Quicker point to point journey times	£1,084	Per metre (based on 4 track)	HS2
Re-signalling	Quicker point to point journey times	£320,000	Per km	HS2

New Bridge (single span – 12.6m wide)	Quicker point to point journey times	£2,346	Per sq metre	HS2
Level Crossing Closures	Quicker point to point journey times	£100k - £6,000,000	Level Crossing closures - dependent on whether right of way is to be retained.	Network Rail Infrastructure Projects
New viaduct (12.6m wide)	Higher line speeds across asset	£1,072	(0 – 10m high) 2 track viaduct per sq metre	HS2

Table 21. High level options to close the gap

## 6.8. Capacity and Comfort

Providing sufficient track capacity to ensure that the current and future growth on rail can be met is critical to the South West peninsula economy. The studies that have been undertaken within this section have looked at increasing capacity through the Northern Route and the Dawlish Additional Line.

## 6.9. The Northern Route (Exeter to Plymouth via Okehampton) study

Following the breach of the railway at Dawlish caused by extreme weather in February 2014, the Government commissioned NR to report on options to maintain a resilient rail service to the South West peninsula in the event of extreme weather events occurring again.

In addition to strengthening the existing route, NR commissioned appraisal work to assess the outline business case for seven potential diversionary routes. Economic appraisal of the alternative route options, consistent with Department for Transport (DfT) WebTAG guidance, demonstrated at that time that each option represented poor value for money.

However, the assessments were undertaken under the assumption that the alternative routes would replace the Dawlish line for travel between Exeter and Plymouth and beyond. The appraisal focussed on the costs and benefits of providing an improved service from Exeter to Plymouth and the resilience benefits brought about by reduced disruption.<sup>34</sup>

<sup>34</sup> Network Rail - West of Exeter Route Resilience Study Summer 2014



The PRTF therefore commissioned Jacobs to undertake an assessment of the Northern Route scheme. This project sought to identify the conditions required for a sustainable railway serving the South West peninsula and the likely conclusions of an Economic Case, were a bid for funding to Central Government to be made.

*Based on the assessment undertaken the case for reopening the complete route between Exeter and Plymouth via Okehampton has a BCR less than one as a standalone local connectivity scheme; which nevertheless augments the wider connectivity case for reopening the line.*

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This report revisits several of the assumptions underlying the assessment of Option 3 (Alternative Route A) - a reinstated railway via Tavistock and Okehampton along the former London and South West Railway route.

*The principal change is that the function of the Northern Route is not to bypass Dawlish and provide main-line rail connectivity between Exeter and Plymouth via Okehampton. Instead its proposed function is to provide (a) a modest service serving local stations with (b) a diversionary capability should disruption e.g. at Dawlish take place and in the event of any disruption between Exeter and Plymouth.*

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The proposed route includes analysis of six potential new station locations: Tavistock, Lydford, Sourton Parkway, Okehampton East, North Tawton and Bow as well as the existing station at Okehampton which presently is served by a summer only Sunday service.

*It is proposed that the route opening be split into 3 phases. Phase 1 - Exeter to Okehampton (on existing line), Phase 2 - Bere Alston to Tavistock (A Devon CC aim), and Phase 3 - Tavistock to Okehampton*

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The analysis has not included any additional benefits that will derive from a second route into the peninsula west of Exeter, or those which could only be identified through specific interviews with businesses.

*This scheme will provide significant (but unquantifiable) benefits to network resilience through providing a diversionary route when disruption occurs on the main line between Exeter and Plymouth, where even excepting recent weather-related breaches, the incidence of disruption is significant.*

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The cost of Alternative Route A with double track throughout and a high operating speed was estimated by NR at £875m, including 66% uplift for optimism bias / contingency. The estimated cost per mile of the works, without flood risk alleviation, is broadly comparable to those for the

Borders Rail and Airdrie-Bathgate projects in Scotland. However, a higher proportion of viaducts and bridges on Alternative Route A, including Meldon viaduct, was assumed to increase costs.

Raising the existing track level through areas of flood risk was calculated to cost up to £290m in a worst case scenario, in addition to the £875m identified for core works (but would also be needed for the existing line to Barnstaple). This estimate was considered high, as it takes into account the greatest volume of additional works that might be required, and assumes relatively high unit rates.

For the remainder of this report, a full route cost between Exeter and Plymouth of £510m has been assumed as the zero cost has been assigned to the route section between Okehampton and Exeter. The cost of the section between Okehampton and Tavistock is assumed to be £450m.

### **6.9.1. The Northern Route (Exeter to Plymouth via Okehampton) study Key findings**

1. Based on a simple per kilometre cost from the Bere Alston to Tavistock rail scheme and a per kilometre cost from the Borders Railway, a cost in the order of £450m has been estimated. This is lower than calculated by NR but assumes a lower standard of route throughout.
2. Two methodologies (Mode choice logit modelling and Propensity to travel) have been used to predict the likely future usage of the proposed rail route. Both methodologies give broadly consistent results and further align with the patronage levels reported for the first months of operation of the Borders Railway. However, patronage has been assessed to be lower in comparison to the Borders Railway and therefore the future predicted patronage is still considered to be optimistic. For stations between Lydford and Bow, there could be up to 192,000 annual trips by 2021. However, the only lesson learnt from recent line and station reopening elsewhere is that predictions tend to be significantly lower than reality.
3. The operating costs and revenue impacts of the new rail service have been compared and it has been shown that with the predicted patronage under current planning assumptions, there would be a significant shortfall between revenue (£1.128m per annum) and costs (£3.918m per annum). This of course excludes the (unquantifiable but significant) benefits to the peninsula economy through the resilience offered by this diversion route. In order to overcome this shortfall by revenue alone, a significant change in planning policy would be required, to the extent that one calculation suggests that 25,700 new dwellings would need to be constructed in areas of Devon which relate to where new stations would be built.
- 4.

5. Several sources of benefits have been examined and estimated. These include rail user transport economic efficiency, marginal external costs, resilience benefits and option values. Overall, these benefits sum to a modest positive figure of £88.332m. It should be noted however that the majority of these benefits are attributed to resilience benefits which are considered particularly uncertain.
6. Using data from the Borders and Tavistock studies<sup>35</sup> rail reopening schemes, it is suggested that the cost estimate used by NR, which assumes a double track high specification line between Exeter and Plymouth, can be reduced significantly if a lower standard of route is constructed.
7. There is an existing, operational line between Okehampton and Exeter, which runs summer Sunday services and Devon County Council has been progressing work on reopening of the line between Tavistock and Plymouth (via Bere Alston). A phased development of rail links serving Exeter and Okehampton, and Plymouth and Tavistock will therefore deliver improved travel to work connectivity with added tourism benefits for Dartmoor National Park and links to North Cornwall. As economic and housing market conditions allow, the opportunity for a full reopening of the 'Northern' route should be explored from Exeter to Plymouth via Okehampton.

## **6.10. The Dawlish Additional Line Study**

The Dawlish Additional Line (DAL) study was commissioned to understand three objectives:

- To provide evidence for an increase in network capacity between Exeter, Paignton and Plymouth, especially in view of the resilience issues associated with the existing line between Exeter and Newton Abbot;
- To define the local rail service proposals up to the 2043 planning horizon used by NR and assess the implications for investment in the network, including electrification; and
- To demonstrate the predicted growth in rail demand in the South West peninsula.

A timetable was prepared using the frequency of service and stopping pattern envisaged by the PRTF to meet future needs and to test if it can be accommodated on the existing infrastructure, with some signalling and track enhancements, or if an additional line is required.

Clearly the strongest argument for a new route is the need to provide a resilient railway to Plymouth and Cornwall, which is also able to cope with demand growth. Despite considerable expense and effort by NR, it is likely there will be an increasing number of occasions when the coastal route will be disrupted or closed, and given the predictions about levels of weather-related disruption, it is not inconceivable that the route may be breached again in the future without significant upgrading.

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<sup>35</sup> Devon County Council Northern Rail Route Passenger forecasts

*Even if a new route is constructed, the coastal route will need to remain open as it provides an important link to the communities it serves.*

The proposed new Dawlish Additional Line will, if built to modern standards, be more resilient to severe weather than the existing coastal route. It is not the purpose of this report to come to definitive conclusions on the impact that future weather-related closures will have on the railway.

*Based on current passenger growth rates, serious interventions will be required by 2026 and 2036, between Exeter and Plymouth a number of years earlier than the rail industry are currently planning.*

However, this report does discuss possible implications of future closures of the railway along the Dawlish sea wall on the growth of demand and on the utilisation of the railway in general.

The case for an additional railway route becomes stronger when capacity, journey time, and resilience benefits are considered together, as in this report, rather than in isolation. As the resilience of the route becomes clearer, the issue of a new route will need revisiting in conjunction with demand growing to such an extent that the capacity offered by the existing route is insufficient, even after all proposed upgrades are delivered.

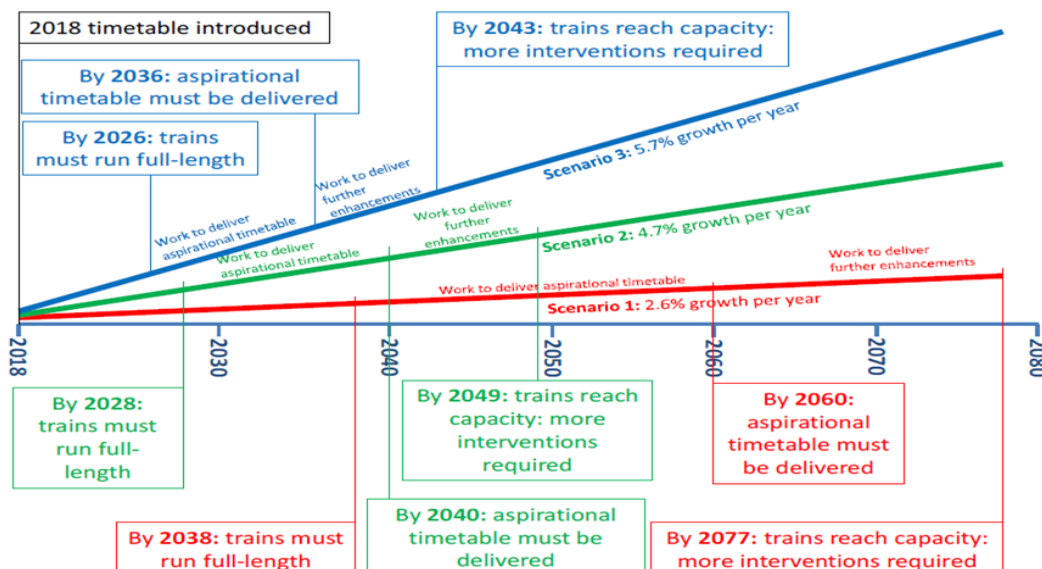


Figure 9 – Timeline for the implementation of key upgrades on the D&C main line

The current coastal rail route between Exeter and Newton Abbot follows the coast line and has proven to be extremely vulnerable to the incursion of seawater and potential cliff falls, which

recent experience has proven to be becoming a more frequent event. These events are likely to continue in line with sea level rises and climate change, and have the potential to close the rail connection to the South West peninsula on a regular basis.

Analysis recently conducted as part of this report, and focusing primarily on this coastal route, suggests that currently, speed restrictions are imposed at Dawlish on an average of five days per year, and the down (westbound – nearer the sea) line is closed on four days a year. Complete closures occur once every three or four years.

*The substantial damage caused in 2014 led to the route being closed for 2 months for repairs.*

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In addition, the Voyager trains, operated by Cross Country, cannot operate during period of high sea spray, as the salt water interferes with the train systems. The same report takes analysis of meteorological trends to demonstrate that the frequency of partial or complete closures of the route is almost certain to increase, such that the route would be subject to disruption or closure on up to 40 days a year.

*The coastal route will be closed on an increasing frequency due to climate change and action is required to deal with the resilience issues.*

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According to Dawson et al., whereas a major event such as the one in 2014 occurs – on average – every 4 years, assuming greenhouse gas emissions are maintained at current levels, similar disruption will occur every 2 years from 2020 onwards, and annually from 2040.

### **6.10.1. The Dawlish Additional Line Key Findings**

1. Our assessment of historic demand forecasts and growth trends suggests that demand growth rates as forecast by NR are significantly lower than the rates of demand growth observed in the last two decades. If growth continues at the current pace into the future, the 2018 timetable – even with lengthened train formations - will no longer be sufficient to cater for demand by around 2036-2040. Figure 9 demonstrates key dates by which upgrades will need to be delivered in each of the demand growth scenarios:
2. The NR indicative 2043 timetable will take up most of the capacity between Exeter and Newton Abbot that even the potentially upgraded line will be able to offer and there will be little further spare capacity if any. It is also likely that with the majority of capacity being utilised on a daily basis, service reliability may suffer.
3. A number of infrastructure interventions will be required to implement the DAL Service Specification. These are as follows:

- a. Additional signals between Newton Abbot and Plymouth to reduce headways to 4 minutes.
  - b. Additional crossover at Exeter St David's to remove the need for trains to run on the 'wrong' line between Exeter St David's and Exeter Central in certain instances.
  - c. At least one section with three or four tracks between Newton Abbot and Exeter St David's to allow for fast trains to overtake stopping services without the need for the latter to stand in a loop for protracted periods of time, and to provide enough capacity for extra stations to be accommodated on the line.
4. Additional line and platform is required between Newton Abbot and Newton Abbot West Junction to allow for additional flexibility during periods of disruption. While the DAL Service Specification is different to the 2043 Indicative Train Service Specification (ITSS) specified by NR within the Western Route Study (WRS) (pp. 193 and 203), it is broadly similar – as are the infrastructure interventions recommended by this study and the WRS. The key difference is the timescales within which these interventions are likely to be required – this study suggests these enhancements will be required between 3 and 7 years earlier than the WRS.
  5. Whereas electrification of sections of the route between Exeter St David's, Paignton and Plymouth could potentially reduce journey times, it is unlikely the benefits generated by this solution would offset its cost, as well as the cost of procuring bi-mode rolling stock in addition to the vehicles already ordered by GWR. It is instead recommended that the local authorities served by the railway line pursue the procurement of additional, newer vehicles, which would offer more comfort and better performance characteristics than the units in service today.
  6. It is virtually impossible given the tortuous and steeply-graded nature of the route between Exeter and Plymouth to deliver any meaningful journey time reductions through the raising of line speeds. As such, the Dawlish Additional Line would probably permit the saving of approximately up to 10 minutes between Exeter and Plymouth; provided it were constructed to a 125mph specification, and assuming trains would run non-stop between the two cities.

## **7. Freight**

The requirement to maintain sufficient capacity for freight on the rail network lies with Network Rail, however it is clear that the Department for Transport have a major role to play in policy and influence, in ensuring this capacity is protected and delivered. The PRTF have sought information on the future needs of the freight industry and will continue to work with them to deliver the best solution.

Immediate considerations include:

- The route from Plymouth to Exeter via Okehampton is considerably better for freight than via Dawlish, we suggest having a Route Availability (RA) appropriate for the movement of freight traffic, of RA10.
- The development of future freight, distribution and logistics hubs such as Bridgwater and maintenance of existing activity e. g. maintaining our national nuclear deterrent to transport nuclear waste from Devonport to Sellafield and China clay can only happen if we have a resilient network.
- In general terms, the market is difficult, but there are options such as that InterCity Rail freight are pursuing for parcels and also wagon loads for the retail sector. There are still good aggregates flows and the opportunity to pursue intermodal and just in time supermarket traffic is being pursued.
- For Intermodal freight there is a need for a minimum W10 gauge clearance to allow containers to be carried on route to South West in financially viable wagons. But there is concern from the rail freight industry that there the volumes needed are not readily available to make the flows financially viable

A report commissioned by Plymouth and Cornwall councils in 2012 identified that there are a number of possibilities for introducing further freight within the region, with the most likely connected to the retailing sector. Several sites within the South West peninsula have been identified where future potential exists and these sites are being safe guarded by NR.<sup>36</sup>

## 8. References

- PRTF: Dawlish Additional Line Assessment, WSP/Parson Brinkerhoff Feb 2016
- PRTF: Northern Route Study Jacobs March 2016
- Journey Time Improvements report NR March 2016
- NR Western Route Study 2015
- Dawson et al 2012, 2015, 2016
- West of Exeter route resilience study NR summer 2014
- Western Capacity improvement programme; Exeter to Castle Cary – Summary April 2016 NR
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- Somerset Economic Impact Assessment of the Winter 2013/14 Flooding (2014), Parsons
- Heart of the South West LEP Study- Economic appraisal of rail network upgrade proposals May 2016
- GWR speed to the West GRIP 2 study (Draft v3)
- Network Rail pre-grip options study to meet PRTF journey time aspirations

<sup>36</sup> Plymouth and Cornwall- Review of Retail rail freight potential July 2012 - ORS