

Summary of the
PRTF work
stream studies
and additional
information



PENINSULA RAIL
TASK FORCE

April 2016

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1. Objectives of this report

This report contains a short explanation of the work streams and the key findings that have been obtained from each one. These findings have been used to define a Peninsula Rail Task Force (PRTF) position to inform the final report to Government on the 20 year plan.

2. Background

The context of this report is found in the Peninsula Rail Task Force (PRTF) 3 Point Plan, followed by On Track: the 20 Year Plan Interim Report, responding to government inviting PRTF to work with the Department for Transport and Network Rail to set out a vision and plans in a 20 Year investment strategy. Government commitment to this process is much welcomed, as is widespread agreement that events at Dawlish, Cowley Bridge and the Somerset Levels must never be allowed to be repeated.

This report is therefore a call to arms for the business community, the wider community of the South West peninsula, public sector and stakeholders, together with elected representatives in Westminster, to support the aims and priorities in the plan that are seen as the best way to improve the economy of the South West peninsula through a better railway. Above all, this is about ensuring that Passengers can travel on a 21st century railway that meets their current and future needs.



There is now wide acceptance of a past long term investment deficit in the Peninsula network compared to other parts of the region and country. HS2 further clarifies the need to address the poor reliability, capacity and slower journey times to London compared to other part of the country. Early agreement to implement a coherent 20 year investment plan for the South West peninsula is therefore essential, to ensure that the region not only continues to perform relative to the rest of UK PLC, but that it can further improve its contribution to UK economic performance.

Rail connectivity is a key enabler of economic growth. The higher than average patronage growth across the South West peninsula is further evidence of rail's vital and increasing impact on the economy. The PRTF 3 Point Plan has three key aims:

- Resilience
- Improved Connectivity and Journey times within and beyond the peninsula
- Improved capacity, quality and comfort.

Our three aims are wholly realistic and no less than that enjoyed by other parts of the country. A network is only as good as its weakest points: our proposal sets out an interlocking set of proposals, mutually reliant on each other to improve the overall rail network through implementing the complete programme. Without resilience, improved connectivity and capacity are illusory; without sufficient capacity and competitive journey times, the network will continue to under-deliver on the economy.

Improving the key connectivity flows for the South West peninsula is vital to align connectivity with the economic needs of the Peninsula, and will provide the catalyst for economic transformation:

- Within the Peninsula
- With Bristol and beyond
- With London

Good connectivity is essential with other national schemes including Heathrow Western extension, HS2 (connectivity both in London and Birmingham), Crossrail – to avoid the SW peninsula lagging further behind).

Delivery of the 20 Year Plan will be an enabler to Hinkley Point development, given its size; labour resource needs across, and beyond, the region; the length of building phase; and long-term impact on the local economy.

The complexity of some elements of the programme requires a staged implementation across more than one five year investment control period, through a sequenced programme.

Many causes of disruption to the rail network occur, virtually routinely. These are seen as both “normal” and inevitable - with significant frequency in addition to the recent catastrophic line disruption. A second route will offset this disruption for large parts of the peninsula, each time the main line is closed. Since April 2014 – April 2016 (i.e. after Dawlish was restored) the line was closed or had significant disruption on 32 days (>4% of days). In the period 1997-2009 5% of winter train services were affected by overtopping at Dawlish alone; trend forecasts indicate that sea-level rises and climate change affecting weather patterns can be expected to result in disruption or closure on up to 40 days a year by 2040 (Dawson, Plymouth University 2012).

The cost to the economy of the Dawlish breach at the time, while not possible to accurately quantify, is widely accepted as being in the range between £140m and £1.2b. What is also not known is the extent of the long term damage to the South West economy through lack of future confidence in good connectivity for the peninsula.

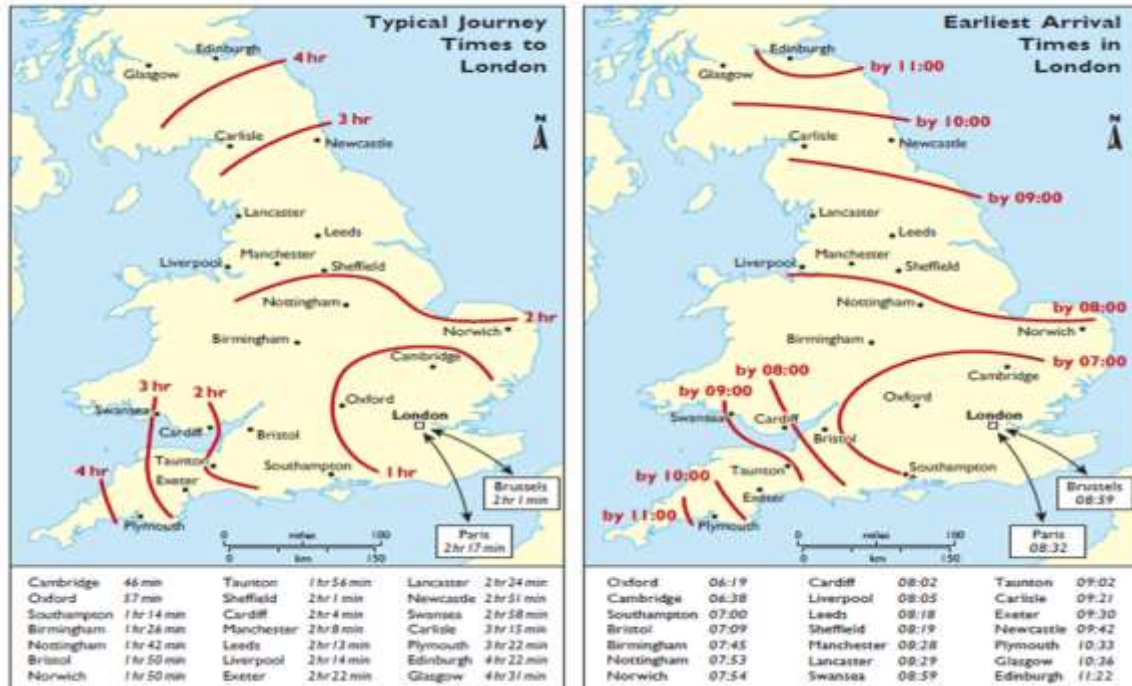
The advantages of additional routes into the peninsula therefore include general network resilience by providing a diversionary route in the event of disruption on the main line, greater capacity in the context of forecast growth, and additional freight paths (large rail freight contracts tend to be based on the availability of a diversionary route).

In addition to Network Rail work on journey time improvements, PRTF aims are for a degree of parity with other parts of the country, indicating the following times from London:

Penzance	4h 10m
Truro	3h 30m
Plymouth	2h 15m
Newton Abbot	2h 00m
Exeter	1h 45m
Taunton	1h 30m

Improved frequency to Paddington to two trains an hour from the 2019/20 franchise is a key enabler to provide up to date services - making calling patterns relevant for today and tomorrow, through providing both faster journey times into the peninsula and better connectivity with other lines – in particular hourly calls at Westbury.

The need for better connectivity outside the peninsula is illustrated in the map below. However it is recognised that, further west into the peninsula the scope for (cumulative) journey time improvement increases, while the population benefiting from these improvement decreases - and that a tipping point on cost: benefit may therefore occur.



Organising connectivity to meet current and future economic needs of the peninsula will be a key driver for future growth. The 20 Year Plan does not identify possible service changes, but expects connectivity to be improved throughout our communities as a result.

High patronage growth, across all peninsula lines, has driven the need for frequency and capacity enhancements (reflected in the 2018 Great Western franchise enhancements). Network Rail predictions indicate the need for further line capacity/ infrastructure enhancements if future growth is not to be choked off. The investment in the new AT300 trains for Paddington services is one important step in improving services; but will need investment in line speed improvements to maximise the economic return on this investment.



Planned capacity and frequency improvements by 2018 in the current Great Western Franchise also form an essential step towards meeting current capacity on needs on local services. We recognise that the introduction of the new AT300 trains will deliver a 24% increase in seating, and the local services cascade will increase commuting capacity within the region, this is just the start!.

The combination of better resilience, improved journey times and greater capacity will create a railway to and from the South West peninsula that is fit for the 21st century. These changes will drive a step change in the level of service offered to customers on this route.

3. East of Exeter resilience

As a result of the flooding related disruption over the last few years the Peninsula Rail Task Force (PRTF) has commissioned a number of studies looking at resilience, journey times and capacity, of which this study is one of those report. The PRTF is made up of 5 Local authorities and 2 LEP's and seeks to represent the interests of Cornwall, Devon, Plymouth, Somerset and Torbay in improving the rail network and services that drive economic growth in the South West.

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.

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 SW and highlighted the limited strategic route options into and out of the SW 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.

3.1. Key Findings

- 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 Network Rail of the 2013/14 events were estimated at £4m of immediate repairs and £13m in compensation costs.
- In September 2014 Network Rail 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 Network Rail of these disruptions. The analysis (Figure 3) 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.

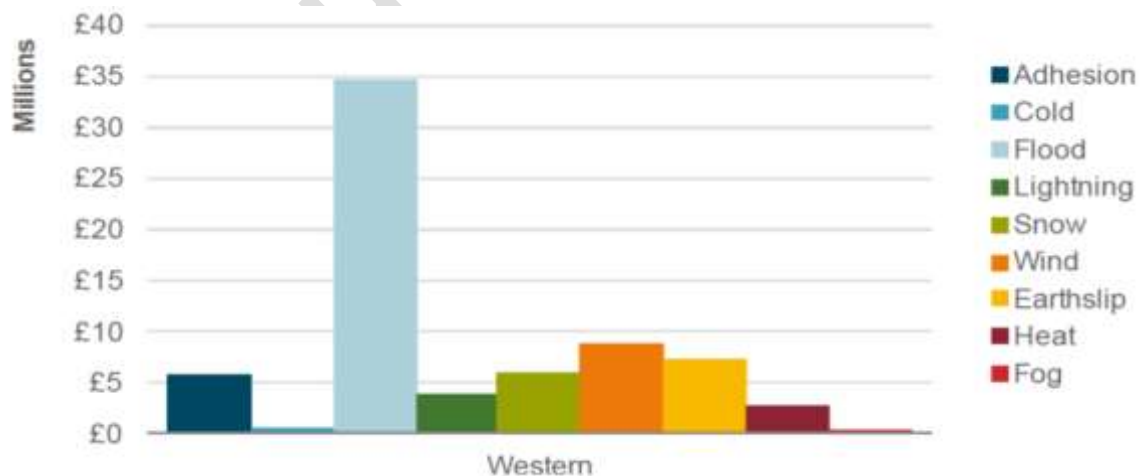


Figure 4 Western Route weather attributed Schedule 8 costs 2006/07-2013/14

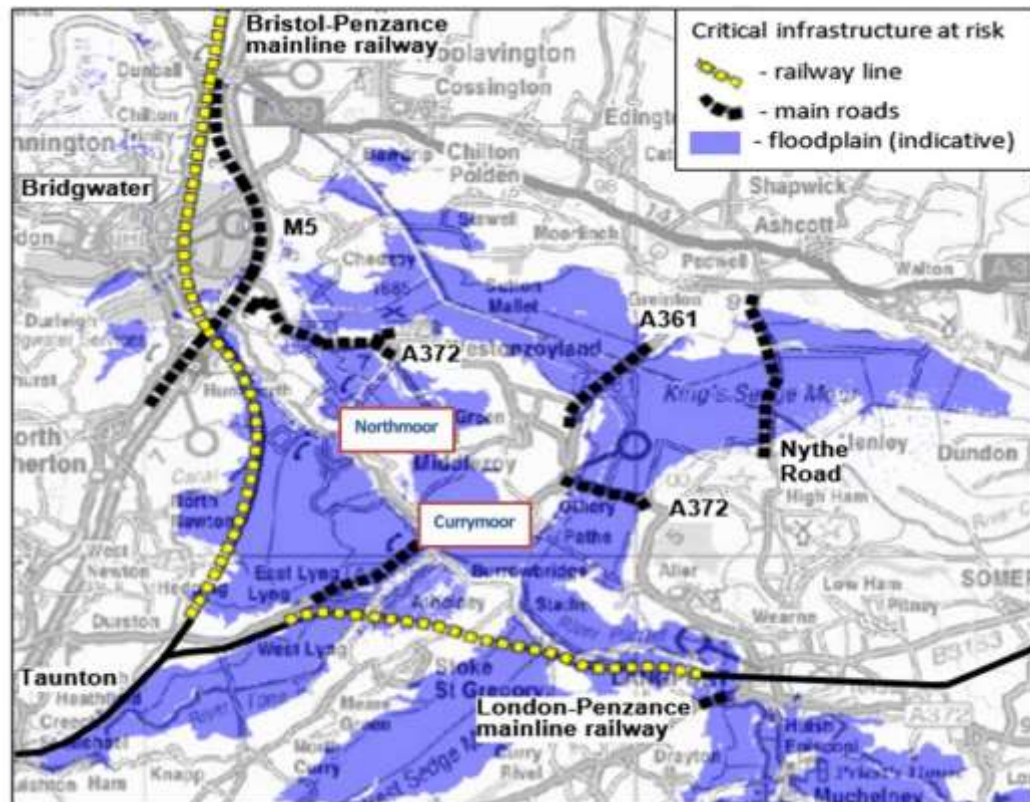
- The areas most affected by the floods of 2013/4 were in large part the same areas which were identified as being most susceptible following the 2012 flooding events. The primary impacts to the rail network were felt in the Northmoor and Currymoor areas of the Somerset Levels & Moors. Contained within 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 SW 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	Groundwater	Fluvial	Estuarine	2013/14	2012	Other Occurrences	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 Scour defences to embankment	Complete 2016 New Proposal
Fordgate – Cogload				✓	✓	✓		Related to outcomes of EA floodplain study	
Cowley Bridge Junction and Staffords Bridge			✓			✓		Major works to be agreed with the Environment Agency	TBC

Hele & Bradninch			✓		✓	✓	Annual	Enable water flow under infrastructure	
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- Network Rail 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 Network Rail flood defence scheme is generally to design for a 1:50 year event. NR is exploring whether this can be further increased for the proposed schemes. Once complete resilience at each of these sites will be significantly improved. In addition to these works Network Rail 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 SLMs 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.
- 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 across the Somerset Levels and Moors. 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.



- 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.
- 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. Network Rail is currently investigating options for

- scour protection at this location which, once implemented would mitigate against this problem.
- 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.
 - 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 SLMs should have reduced the impact of such an event on the railway and reduce the duration of major disruption in the future.
 - Network Rail 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.
 - Even with the significant investment which has and is occurring there is still a risk to the rail network east of Exeter. Further analysis is required to better understand exactly what the risk is of major disruption being caused by extreme weather. It is not possible to completely remove the risk; the work undertaken to date and currently planned will have resulted in significant improvements. What is required is a debate about what is the level of risk and disruption that is 'acceptable' based upon a realistic assessment of the costs to further reduce the risk and ensure as resilient and reliable a railway for the SW.
 - The combination of flooding across the SLMs and the catastrophic failure of the sea wall at Dawlish resulted in a perception of the SW being 'closed for

business'; anecdotally businesses beyond the affected areas reported feedback from customers that they assumed their business was cut off.

- It was estimated that the direct cost of disruption to the Somerset economy was in the region of £92m and the indirect impact was as measured by GVA was approximately £13m. Of this between £13m and £21m was attributed to 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

3.2. PRTF assumptions taken into report

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| <ul style="list-style-type: none">a) That schemes currently planned by Network rail and the Somerset River Authority will proceed as planned.b) That further analysis will be undertaken to understand the residual risk and impact once all works are completed.c) That the risk of disruption due to extreme weather cannot be completely removed and that agreement must be reached on an acceptable level of risk. |
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4. Seawall and cliffs Resilience

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. 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.

Estimates of the economic cost have therefore varied significantly. On average, some 12,500 rail journeys are made across this route each day.

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, Network Rail has commissioned a high level study to look at sustainable routes between Exeter and Plymouth. This study forms a part of Network Rail'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.

This report summarises the findings of Network Rail's high level study. These findings do not commit Network Rail 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 with other long term outputs required from Network Rail's Western Route, including improvements to reliability, connectivity, capacity, and journey time.

Appraisal work was commissioned by Network Rail 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:

- 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
- 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
- To devise appropriate train service specifications for each route option, taking advantage of the new route:
 - For planned train services only where it offers journey time savings compared with the existing route via Dawlish
 - For diversions on those occasions when the route via Dawlish is not available for traffic
- To assess the likely scale of passenger demand and revenue impacts for each option
- To assess the annual operating costs for each option
- 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

- 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.

Following on from these early reports Network Rail 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 Network Rail will release the results of the work once it is finalised, detailing and consulting on the options available for improved resilience.

4.1. Key Findings

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 ¹
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

¹ 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.

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

A range of sensitivity tests were undertaken:

- An enhanced timetable scenario with nearly twice the number of trains.
- Reduction of 50 per cent in the capital cost outlay.
- Increased duration of railway closure following damage.
- 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.

The table below summarises the options against a range of key success factors;

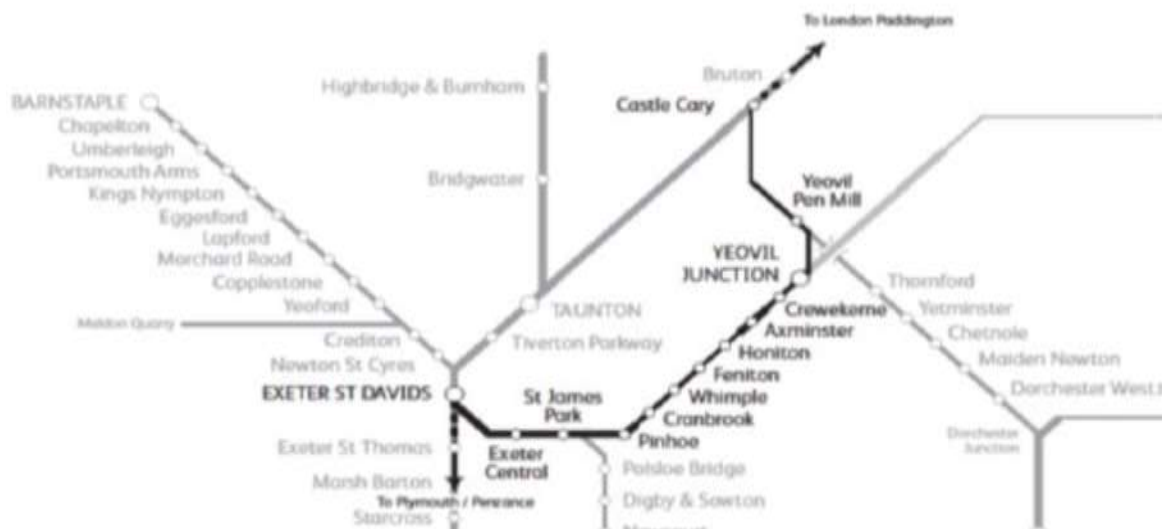
Table 9: Summary of option performance against critical success factors								
Option	Feasible?	Technically compliant?	Resilient?	Capable?	Safe?	Efficient?	Fast?	Value for money compared to base
Option 1 - Base Case of maintain existing railway	Technically feasible	May not be suitable for resilient continuous electrification - electric trains may need independent power (e.g. diesel or battery) over some stretches	Unproven very long term impact of proposed coastal works against rising sea levels	No change to capability	Provides the opportunity to improve maintainer safety	Whole life cost may be compromised if further storm damage occurs	No change to journey times	Base case
Option 2 - Further strengthening the existing railway	Technically feasible	Likely to be suitable for continuous electrification	Mitigates anticipated storm and flood risk	No change to capability	Provides the opportunity to improve maintainer safety	Whole life cost may be compromised if further storm damage occurs	No change to journey times	To be assessed
Option 3 (Alternative Route A) - L&SWR route	Technically feasible	Limited clearances and further work needed to support electrification	Resilient with embankments raised in the Creedy valley	Similar to current capability, but requires reversal at Exeter and Plymouth	Generally similar to current - but maintenance access restricted in some areas	Re-used 19 th century earthworks may include some deficient sections, compromising whole life cost	Slower to Plymouth, significantly slower to places further west	Poor
Option 4 (Alternative Route B) - Teign valley route	Technically feasible	Meets all current standards, suitable for electrification	Not resilient - prone to flooding, mitigation likely to be impractical	Increases capacity between Exeter and Newton Abbot	Improved maintainer safety	Potentially poor whole life cost as flood prone	Slightly slower to Newton Abbot and Plymouth	Poor
Option 5 (Alternative Route C1) - Alphington to Ware Barton	Technically feasible	Meets all current standards, suitable for electrification	Avoids a high proportion of storm and flood risk	Increases capacity between Exeter and Newton Abbot	Improved maintainer safety	Good whole life cost for new infrastructure	Improved journey times to Newton Abbot and Plymouth	Poor
Option 5 (Alternative Route C2) - Exminster to Ware Barton (western)	Technically feasible	Meets all current standards, suitable for electrification	Avoids a moderate proportion of storm and flood risk	Increases capacity between Exeter and Newton Abbot	Improved maintainer safety	Good whole life cost for new infrastructure	Improved journey times to Newton Abbot and Plymouth	Poor
Option 5 (Alternative Route C3) - Exminster to Ware Barton (eastern)	Technically feasible	Meets all current standards, suitable for electrification	Avoids a moderate proportion of storm and flood risk	Increases capacity between Exeter and Newton Abbot	Improved maintainer safety	Good whole life cost for new infrastructure	Improved journey times to Newton Abbot and Plymouth	Poor
Option 5 (Alternative Route C4) - Exminster to Bishopsteignton	Technically feasible	Meets all current standards, suitable for electrification	Avoids a moderate proportion of storm and flood risk	Increases capacity between Exeter and Newton Abbot	Improved maintainer safety	Good whole life cost for new infrastructure	Improved journey times to Newton Abbot and Plymouth	Poor
Option 5 (Alternative Route C5) - Dawlish Warren to Bishopsteignton	Technically feasible	Meets all current standards, suitable for electrification	Avoids a limited proportion of storm and flood risk	Increases capacity between Exeter and Newton Abbot	Improved maintainer safety	Good whole life cost for new infrastructure	Slightly improved journey times to Newton Abbot and Plymouth	Poor

4.2. PRTF assumptions taken into report

- a) None of the additional routes identified within the Network Rail report are able to create a BCR in their own right, based on the initial work undertaken by Network Rail.
- b) 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.
- c) When available the outputs of the current GRIP 2 study being undertaken will be released and consulted upon by Network Rail independently of this report.

5. Exeter to Castle Cary Diversionary route²

Following the publication of the Western Route Study, the Department for Transport remitted Network Rail 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).



² Western Capacity improvement programme; Exeter to Castle Cary – Summary April 2016 Network Rail

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.

Network Rail 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
- "Vision 4": Greatest Flexibility – Double track railway supporting diverted GWR trains plus various Devon Metro scenarios

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:

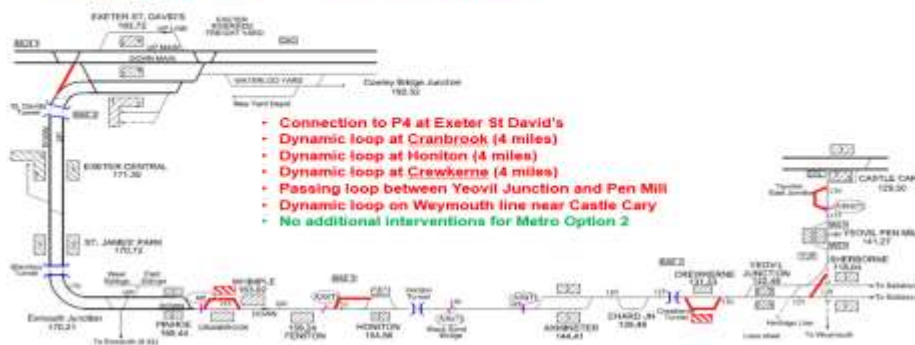
- Connection from the BAE2 to Platform 4 at Exeter St David's
- Dynamic Loop (4 miles) at Cranbrook
- Dynamic Loop (4 miles) at Honiton
- Dynamic Loop (4 miles) at Crewkerne
- Passing loop between Yeovil Pen Mill and Yeovil Junction
- Linespeed improvements at Yeovil Pen Mill – re-signal the mechanical 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.

5.1. Key Findings

Vision 1 – lowest cost

Diverted GWR trains plus Devon Metro Option 2



Vision 2 – Clockface service

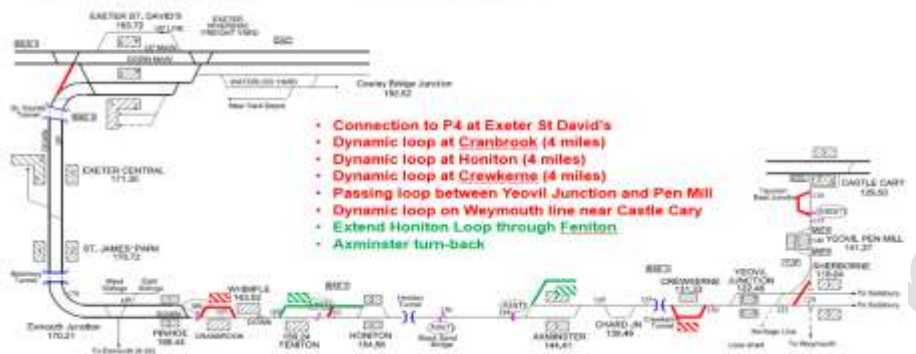
The scope of works for Vision 2 is to provide an even clockface service pattern for the Devon Metro Services to Axminster. Additional infrastructure beyond that required for vision 1 is detailed below:

- 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



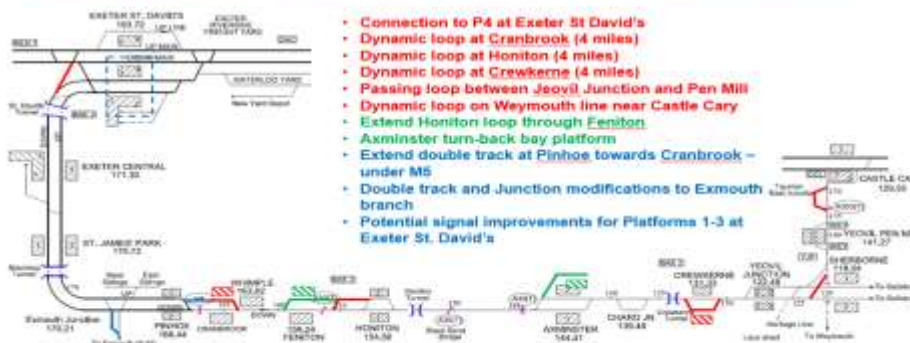
Vision 3 – Enhanced Performance

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

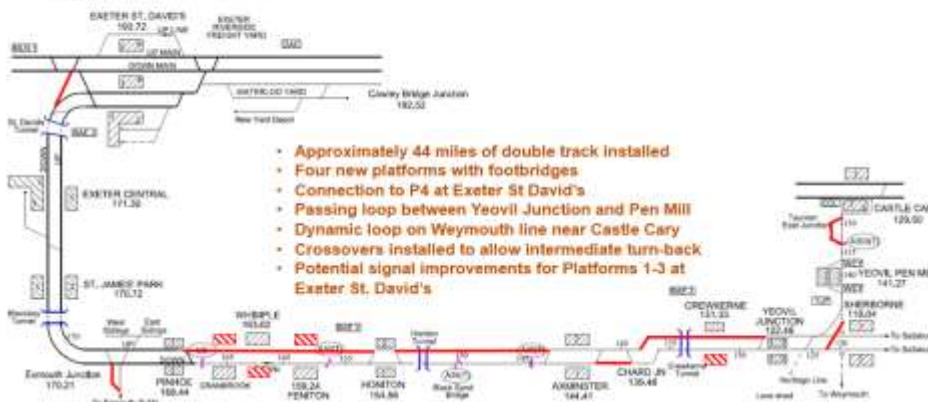


Vision 4 – Greatest Flexibility

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

Vision 1: Lowest cost

Pros

- Least Cost
- Shortest delivery programme
- Avoids key constraints such as the M5 bridge, Honiton tunnel and Crewkerne tunnel

Cons

- Least flexible options
- Devon Metro service not clock face

Vision 2: Clock face service

- Least cost option which still provides clock face departures
- Still avoids the key constraints identified above

- Requires potentially complex reworking of Feniton Level Crossing and the highway, which are sited on the redundant track bed

**Vision 3:
Enhanced performance**

- Provides improved operational resilience and opportunity for enhanced Exmouth services
- Costly intervention required to double track under the M5
- Significant escalation in cost for potentially small improvement in performance

**Vision 4:
Greatest flexibility**

- Fully flexible railway to accommodate any future service aspiration
- Very costly, with approx 28 miles more double tracking required above option 2
- Probable track lowering required at Honiton and Crewkerne
- Route studies and stakeholder consultation does not indicate demand for this level of infrastructure

5.2. PRTF assumptions taken into report

- | |
|--|
| <p>a) 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.</p> |
|--|

6. Exeter to Waterloo

As with the route to London Paddington there is scope to reduce journey times along the London Waterloo – Exeter route via infrastructure enhancements to allow both increased frequency and line speed operation.

PRTF is also working with 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)

7. The Northern Route (Exeter to Plymouth via Okehampton)

Jacobs were commissioned to undertake an assessment of the Peninsular Rail Task Force (PRTF) Northern Route scheme. This project seeks 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.

Following a breach of the railway at Dawlish caused by extreme weather in February 2014, the Government commissioned Network Rail to report on options to maintain a resilient rail service to the South West peninsula in the event of extreme weather events occurring again. The study forms a part of Network Rail's Long Term Planning Process.

Several options were identified in addition to strengthening the existing route and appraisal work was commissioned by Network Rail to assess the outline business case for each of the seven potential diversionary routes it identified. Economic appraisal of the alternative route options, consistent with Department for Transport (DfT) WebTAG guidance, demonstrated that each option represents 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.

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 no longer 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.

Detail of the assumptions made, methodology and results are discussed later in this report. The proposed route includes six 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.

7.1. Key Findings

- This study has examined the potential costs and benefits, and the likely rail revenue impacts of a proposed reinstated rail line between Okehampton and Tavistock.
- 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 Network Rail but assumes a lower standard of route throughout.
- Two methodologies 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, the offer of the Northern Rail route compared to car is likely to be poor 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.
- 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). In order to overcome this shortfall, a significant change in planning policy would be required,

to the extent that 25,700 new dwellings would need to be constructed between the settlements of Bow, Okehampton, Tavistock, Lydford and North Tawton.

- 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.

The results of the study have shown that those benefits that can be quantified (local connectivity benefits) show the scheme representing poor value for money, principally due to the extremely high capital investment costs. The analysis does not include 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.

7.2. Costings

The cost of Alternative Route A with double track throughout and a high operating speed was estimated by Network Rail 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.

Using data from two separate rail reopening schemes, it is suggested that the cost estimate used by Network Rail, which assumes a double track high specification line between Exeter and Plymouth, can be reduced significantly if a lower standard of route is constructed.

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.

7.3. PRTF assumptions taken into the report

- a) 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, with insufficient levels of population to support the service.
- b) 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
- c) 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 (see section 3.3), where even excepting recent weather-related breaches, the incidence of disruption is significant.

8. Journey Time Improvements part 1

The Peninsula Rail Task Force (PRTF) published a report (the Peninsula Rail Task Force 20 Year Plan Interim Report) in October 2015 with three priorities:

- Resilience: Flooding schemes at Cowley Bridge and Somerset levels, Dawlish seawall and cliffs stability, GRIP 2 studies for passing loops between Exeter and Yeovil for mainline services.
- Journey Time Improvements:
 - Part 1: maximisation of the benefits of the AT300 introduction in December 2018;
 - 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.

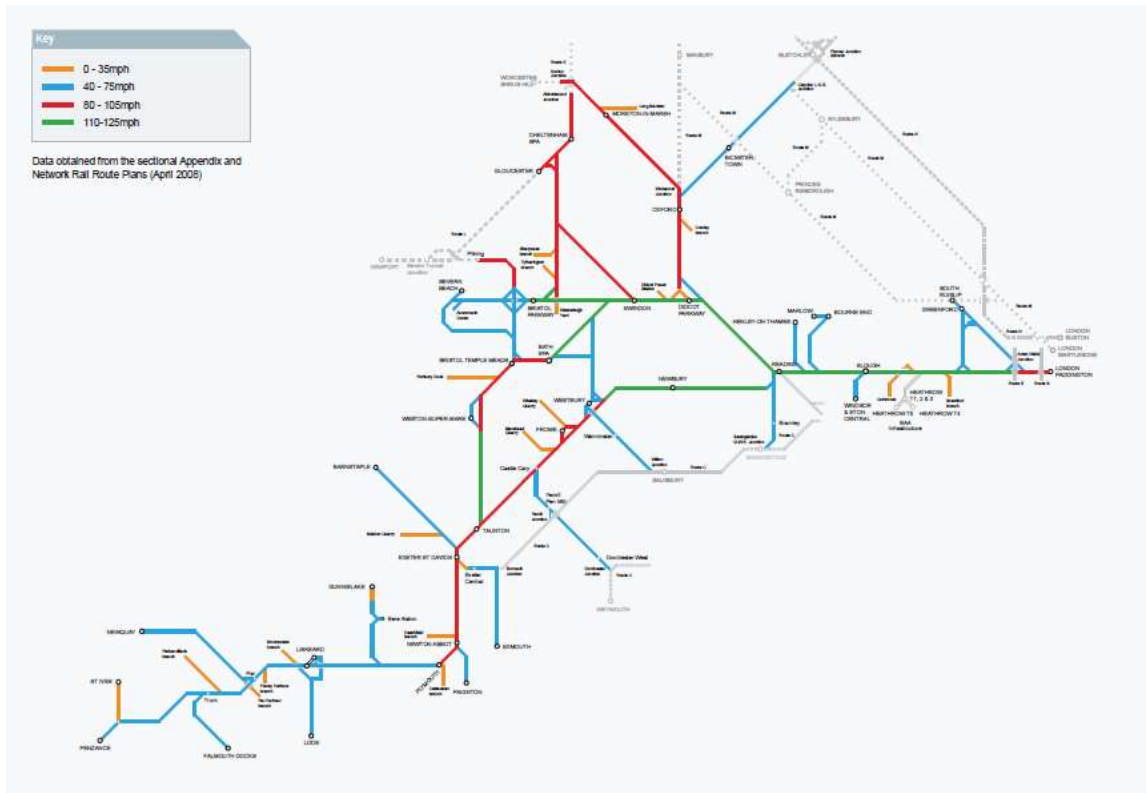


Figure 1 Speeds across the mainline between London and Penzance

- Increasing Capacity: through the GRIP 2 study, between Exeter and Castle Cary via Yeovil, evaluation of the Northern Route, and the Dawlish Avoiding Line.
- This report fulfils Part I of the Journey Time Improvement work stream, collectively known as 'Part I'.
- It should be noted that Network Rail does not currently have access to the AT300 performance data and therefore this report illustrates the work previously completed to identify interventions that could improve journey times between London and the South West peninsula. Further work would be required to validate the AT300 data when it becomes available to ensure that it aligns with this previous work.
- There are many references to Route Runner within this report. It is worth noting that Route Runner is a fairly basic line speed estimating tool that does not factor in elements such as timetabling of other services; section running times; engineering allowances; and junction margins within the overall journey time.

Potential journey time improvements calculated with Route Runner are therefore high-level theoretical results (normally optimistic), and may vary when taking into account differing operator requirements that may be requested when writing timetables. Consequently, Network Rail recommends the use of Railsys for future detailed assessments for more accurate results.

- Additionally, this report does not attempt to outline business case benefits in-line with the Department for Transport's WebTAG assessment process for Rail Investment projects.

8.1. Key findings

- The work completed on potential journey time improvements has highlighted an opportunity to deliver infrastructure enhancements that will facilitate a decrease in average journey times between London and the South West Peninsula.
- Between Reading and Exeter, 65 miles of route have been identified as having the potential to be upgraded, with potential higher line speeds of between 10 and 20 miles per hour. The engineering options for increasing the line speed require work such as track & point end relaying and safety works including (not limited to) cess walkways, signalling train protection systems and level crossing safety mitigations. Level Crossing mitigations could be achieved in differing ways, each having a significant influence on the project costs. Such mitigations could be crossing closure (comparatively low cost impact) or upgrades including Closed Circuit Television or Obstacle Detection (comparatively high cost impact). The current cost to achieve c2¼mins saving is estimated in the region of £42.62m.
- Between Exeter and Penzance, 132.5 miles of route, to achieve approximately 11mins journey time saving would require in the order of £67.6m investment in the Up Main direction towards London, while achieving approximately 12mins saved on the Down Main direction towards Penzance would cost in the order of £63.4m. Work would include re-railing and re-ballasting sections of the route, however the costs exclude any earthworks, gauge and structures clearance, which is likely to add significantly to the total investment required.
- The work required to implement the scheme would include:
 - Track renewal (re-rail and re-sleeper)
 - Tamping recant
 - Tamping realignment

- Therefore, the current cost to achieve c14mins journey time saving from the South West towards London is estimated in the region of £89m, while achieving c15mins from London to the Peninsula is estimated in the region of £85m.
- It is worth noting the current combined cost £174m could be reduced through synergies of work sites, access arrangements and procurement. Subject to funding and a robust business case it is anticipated that projects could start in CP6.
- It is recommended further detailed design, optioneering, site surveys, timetable modelling and analysis is progressed to ascertain the true journey time and economic value through Network Rail's Governance of Railway Investment Projects (GRIP) processes.

8.2. PRTF assumptions taken into the report

- a) 15 minutes time savings appear achievable with improvements to the current infrastructure between Reading and Penzance, at an estimated cost of £174m, equivalent to a GVA uplift for the peninsula of £300m³
- b) Level crossings should be a focus to improve line speed and safety as a quick win through a joint NR and Local Authority approach.
- c) It is recommended that a GRIP 2 level study is undertaken to identify the options and more detailed costings

9. Journey Time part 2

To be added as available

³ Productivity and Wider economic impact study PRTF 2015

9.1. Key Findings

9.2. PRTF assumptions taken into report

10. Journey Time part 3

To be added as available.

10.1. Key Findings

10.2. PRTF assumptions taken into report

11. Economic Report

While 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 vary across the South West Peninsula, overall they appear to be persistently below the national average.

Cornwall is the only English "less developed "area according to EU classifications, with poor connectivity and moderate skills levels being major barriers to growth.

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. 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 time⁴. More recent work conducted for PRTF

⁴ Productivity and Wider economic impact study PRTF 2015

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.

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%.

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

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

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.

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

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.

While infrastructure improvements on their own may not be sufficient to ensure transformational economic performance, as factors such as skills levels are also

instrumental in driving productivity, the improvements in journey time connectivity are a fundamental requirement.

As noted above, the length of journey times between London and the South West Peninsula is reflected in lower levels of productivity, as measured by workplace GVA per head.

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.

11.1. Services to London Paddington

Improved frequency to Paddington to two trains an hour from the 2019/20 franchise is a key enabler to provide up to date services - making calling patterns relevant for today and tomorrow, through providing both faster journey times into the Peninsula and better connectivity with other lines – in particular hourly calls at Westbury.

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
Total	12 mins	14 mins	26 mins

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;

The resulting annual benefit is summarised in the table below.

	10 Year Appraisal (£m)	30 Year Appraisal (£m)
Direct Benefits		
Net benefits to passengers and private sector (plus tax)		
1. Rail user perceived journey time benefits (new & existing users)	£ 74.7	£ 208.6
2. Non user benefits - road decongestion	£ 6.5	£ 21.8
3. Non user benefits - noise, air quality, accident benefits and others	£ 2.0	£ 5.7
4. Total revenue benefit	£ 37.6	£ 96.0
5. Indirect Taxation	-£ 3.4	-£ 7.5
Total Direct Benefits	£ 117.4	£ 324.5
Indirect Benefits (GVA)		
6. Increased Productivity in South West	£ 2.4	£ 6.1
7. Increased Leisure Trips in South West	£ 38.6	£ 90.6

11.2. Services to London Waterloo

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.

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 missing out some station calls, 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. A timetable study to confirm the scale of time savings and to identify more clearly the infrastructure required is to be commissioned in Summer 2016.

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 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

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.

	10 Year Appraisal (£m)		30 Year Appraisal (£m)	
Direct Benefits				
Net benefits to passengers and private sector (plus tax)				
1. Rail user perceived journey time benefits (new & existing users)	£	61.5	£	171.7
2. Non user benefits - road decongestion	£	3.7	£	12.5
3. Non user benefits - noise, air quality, accident benefits and others	£	1.2	£	3.3
4. Total revenue benefit	£	22.0	£	56.2
5. Indirect Taxation	-£	2.0	-£	4.3
Total Direct Benefits	£	86.4	£	239.3
Indirect Benefits (GVA)				
6. Increased Productivity in South West	£	4.5	£	11.2

The LEP 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 study has focused on quantifying the economic benefits of each scheme. Costs have not been assessed in the appraisal, and are not included in this report.

11.3. Key Findings

- 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 in Devon, £19,900 in Plymouth and £17,300 in Cornwall and the Isles of Scilly and £15,500 in Torbay
- The South West peninsula has great potential to improve its economic productivity, when one considers the five key drivers identified by the Treasury and Department for Business Innovation and Skills.
- Overall, the South West has a relatively skilled working age population, coming second amongst regional areas for the proportion of the workforce with NVQ level one, and fourth for the proportion for NVQ level four or above.

- There is a high degree of innovation, with the proportion of innovation active businesses at 48%, second only behind the East Midlands.
- The area is characterised by high levels of entrepreneurial activity and business density, with a significant increase in small business creation over the last few years. However, the overwhelming majority of businesses in the South West are small, with 75% having no employees, and the increase in the total number of businesses is almost entirely down to the start-up of micro businesses with fewer than 5 employees.
- The South West peninsula has a smaller share of exports than almost every other part of the UK, and low levels of a 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 view that emerges of the South West peninsula is an area with skilled workers, innovative businesses and resilient productivity, but one 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.
- The South West peninsula is considered by some to be an unattractive place to do business because of 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.
- Growth deal will provide a total new investment package of over £270m to create at least 13,000 jobs and allow over 8,000 new houses to be built by 2021. A reliable railway with good connectivity will be a key factor in maximising the contribution of this growth to UK PLC
- The wider economic impact from journey time improvements to London ranging from a 6 minute reduction to Taunton to a 36 minute reduction to Penzance is estimated as generating growth in GVA of around £219m per annum (2011 values); productivity declines by 6% for every 100 minutes journey time from the capital (UWE and Bath University 2005).

- 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.
- 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 spend per trip to the South West was £285. The economic impact of the increase in leisure travel to the South West Peninsula is £38.6m over a 10 year period and £90.6m over 30 years.

PROPOSAL	TOTAL ESTIMATED BENEFIT (€M)	
	10 Years	30 Years
London Paddington – Penzance (Direct Benefits)	117.4	310.9
London Paddington – Penzance (Indirect Benefits)	46.9	110.0
London Waterloo – Exeter	86.4	239.3
London Paddington – Penzance Diversionary Route	17.5	47.8

Figure 2. Benefits arising from the diversionary routes

12. 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 2043 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.

The consultant prepared a timetable 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

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.

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.

This report has concluded that, for the time being, there is no justification for the construction of an additional railway alignment on capacity grounds alone. The case 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.

12.1. Key Findings

- Based on the future service aspirations for Devon Metro and the PRTF the DAL Service Specification can be delivered on the Dawlish coastal route between Exeter, Paignton and Plymouth. On this basis, the Dawlish Additional Line is not necessary to deliver the frequency of service warranted by the DAL Service Specification. However, it must be borne in mind that the 2043 timetable will take up most of the capacity that even the upgraded line will be able to offer. It is also likely that with the majority of capacity being utilised on a daily basis, service reliability may suffer.
- Our assessment of historic demand forecasts and growth trends suggests that demand growth rates as forecast by Network Rail 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 1 below demonstrates key dates by which upgrades will need to be delivered in each of the demand growth scenarios:

- A number of infrastructure interventions will be required to implement the DAL Service Specification. These are as follows:
 - Additional signals between Newton Abbot and Plymouth to reduce headways to 4 minutes;
 - 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;
 - 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;
- Additional line and platform is required between Newton Abbot and Newton Abbot West Junction to allow for additional flexibility during periods of disruption. Whereas the DAL Service Specification is different to the 2043 ITSS specified by Network Rail within the Western Route Study (WRS) (pp. 193 and 203), it is 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.
- 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.
- 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.

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

12.2. Growth

It was established that significant differences exist between the industry growth rate predictions and the actual rates that are seen within the South West peninsula.

According to Network Rail, the annual growth rate for rail passenger demand in the South West region is between 2.0% and 3.2%. An annual growth rate of 3.2% for Exeter and Plymouth between 2008 and 2019 is predicted in the Great Western RUS (2010), whereas growth rates of 2.0%, 2.5%, and 3.2% are predicted for journeys across Cornwall between 2013 and 2043 in the Western Route Study (2015). From the latter study, an average annual growth rate of 2.6% can be established.

Growth rates based on station entry and exit records from Office of Rail and Road (ORR, 2015) for stations west of and including Exeter St David's have been found to be higher than predicted by Network Rail. From 1998 to 2015 an annual growth rate of 4.7% is observed, and looking at more recent years the rate is even higher. From 2008 to 2015 the annual growth rate is 5.7%.

The demand data suggests that, should demand grow in future at the same rate as over the past 7 or 17 years, the level of service planned by Network Rail for 2043 will be appropriate for the perceived level of demand 12 to 15 years before this date.

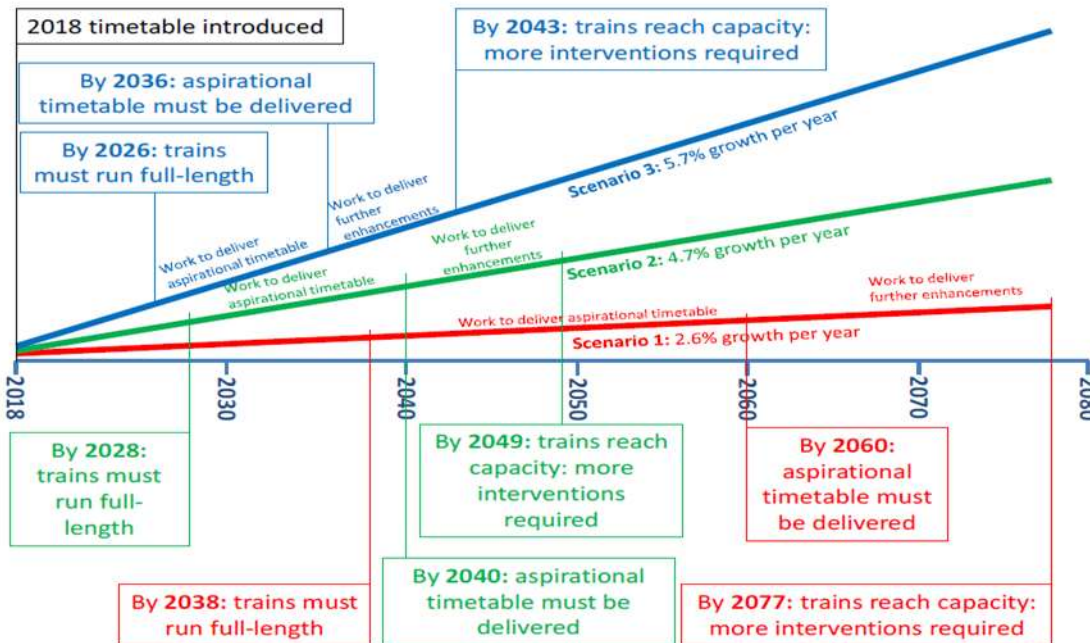


Figure 3 – Timeline for the implementation of key upgrades on the D&C main line

12.3. Resilience

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. 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's 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.

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.

12.4. PRTF assumptions taken into report

- a) The DAL is not immediately required to deal with capacity requirements over the next 20 years, however given predicted growth rates, serious interventions will be required by 2026 and 2036, a number of years before the rail industry are currently planning.
- b) The coastal route will be closed on an increasing frequency due to climate change and action is required to deal with the resilience issues.

13. Freight

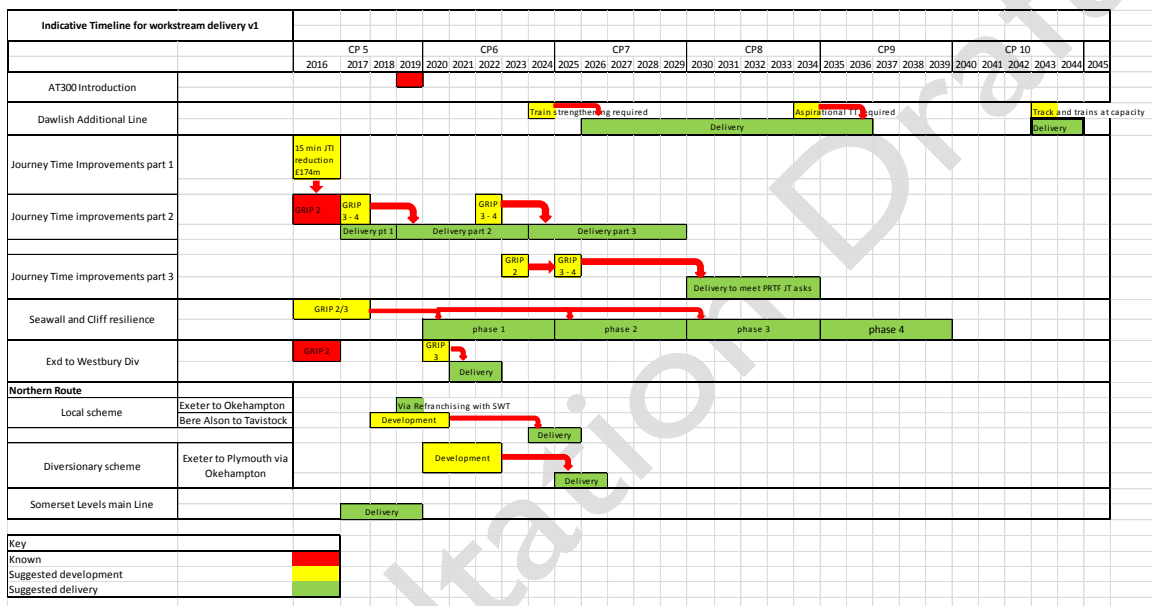
The requirement to maintain sufficient capacity for freight within rail capacity lies with Network Rail, however we have sought information on future needs of the freight industry.

Responses include;

- The Tavistock Okehampton route is considerably better for freight than via Dawlish, we suggest having a Route Availability (RA) appropriate for the movement of freight traffic. Ideally this needs to be RA10, but I would suggest a minimum of RA8.
- In general terms, the market is difficult, but there are options such as those InterCity Railfreight are pursuing for parcels and also wagon loads for the retail sector. Intermodal will be tricky past Exeter for the volume. There are still good aggregates flows and such like.
- For Intermodal there is a need for W10 gauge clearance to allow containers to be carried on route to SW in financial viable wagons. But there is concern from rail freight industry that there are not the volumes needed at the moment to make the flows financially viable. Intermodal terminals needed at Exeter but not currently viable further west

14. Sequencing

With the initial information that is available the high level work packages have been placed on an indicative time line for development and delivery. This information will be expanded as the detailed information flows from the 'Speed to the West' study and forms the basis of the sequencing workshop that will take place later in May, fed by the views of the stakeholder feedback.



15. References

- PRTF: Dawlish Additional Line Assessment, WSP/Parson Brinkerhoff Feb 2016
- PRTF: Northern Route Workstream, 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 Network Rail
- Spine report PRTF 2015
- Productivity and Wider economic impact study PRTF 2015
- Western Route WRCCA Plan (2014), Network Rail
- Somerset Economic Impact Assessment of the Winter 2013/14 Flooding (2014), Parsons