



Network Rail Monitor

*Periods 8-13 of Year 5 of CP5
14 October 2018 to 31 March 2019*

Supplementary information

18 July 2019

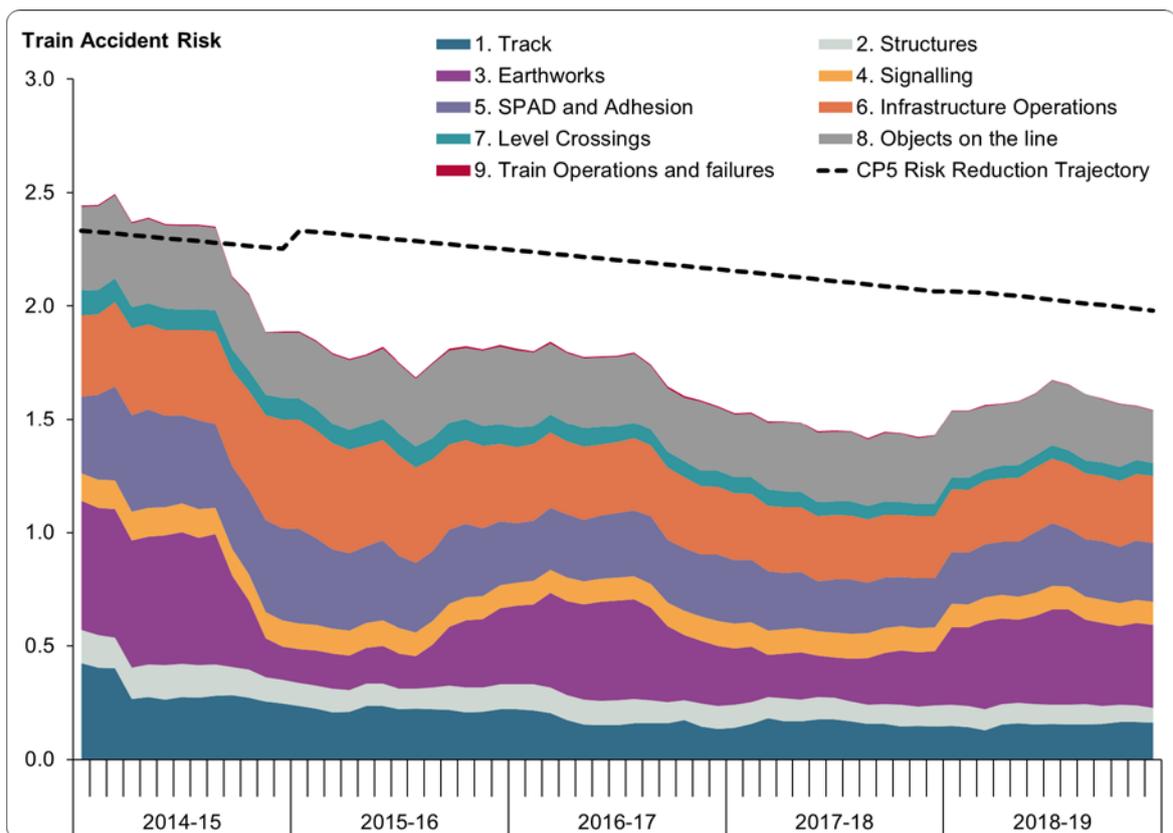
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1. Health and Safety

Performance against key indicators

- 1.1. Network Rail's overall safety performance in Great Britain was positive, although variations highlight the scope for improved maturity in the risk management framework. The Risk Management Maturity Model should help Network Rail to foster a fully robust safety management system.
- 1.2. Accidents to workers declined over CP5 with an overall decrease (i.e. improvement) of 45% in the last time injury frequency rate (LTIFR) and a reduction in accident severity of 51% over the same period. However, LTIFR reductions levelled out in 2018-19. Most accidents in 2018-19 related to manual handling or slips, trips and falls. Network Rail has sensibly identified the latter as a priority and put in place a strategy to reduce these incidents. Train accident risk, as modelled by the precursor indicator model (PIM) continued to track below the CP5 risk reduction trajectory but overall risk continues to be susceptible to weather-related events.



- 1.3. Compared to 2017-18, there were fewer 2018-19 wrong-side failures (WSF's) hazard-ranked 20+ in structures. In contrast, numbers of earthworks, signalling and operations ranked 20+ WSF's rose whilst those in track showed no reduction. These trends are reflected in the detail of the PIM which shows that in 2018-19 earthworks,

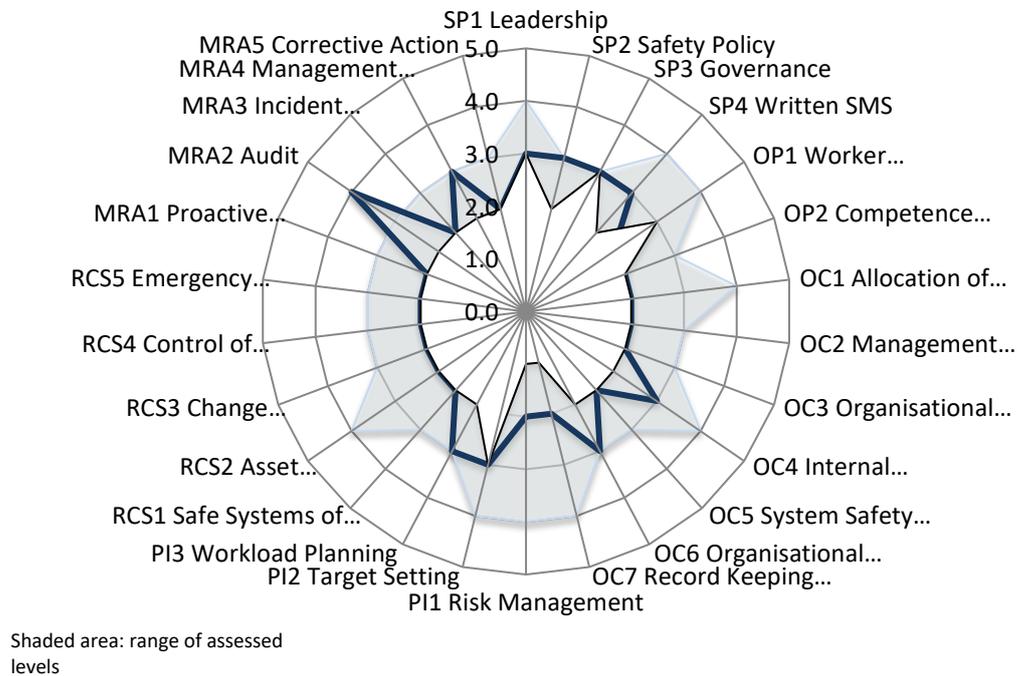
signalling, signals passed at danger (SPAD's) and Network Rail infrastructure operations approached or occasionally passed the CP5 risk reduction target trajectories, whilst track continues to perform significantly below the trajectory. We continued to see good progress in nationally monitored plans for level crossings risk reduction, train accident risk reduction work streams and maintenance volumes. This mixed picture reflects relatively benign weather contributing to risk control following hot weather spells that adversely impacted earthworks and track, the challenges of controlling vegetation, and an increasing trend in wrong-routings.

Inspection and investigation findings

Rail Management maturity model (RM3) findings

1.4. We have focused our work this year on areas where our intelligence suggests Network Rail needs to do better. We have concentrated on fewer areas, but with a greater depth of evidence. While the assessment indicates an overall finding of 'managed', we found greater consistency in the range of attainment across asset disciplines and routes suggesting that Network Rail is achieving a greater degree of control across its businesses. Whilst focusing on relatively narrow areas does not give a comprehensive view of safety management maturity, it does provide a challenging baseline for Network Rail as it starts to undertake its own RM3 assessments.

Network Rail 2018-2019



1.5. We found limited evidence of an effective assurance regime in Network Rail’s geographic routes. Whilst processes were in place, a great deal of reliance was placed on basic self-assurance checks carried out by front-line managers which can be inconsistent. Following Network Rail’s commitment to improve its assurance in 2016-17, we have not seen progress in the routes except in London North Western (LNW) and South East routes where some welcome initiatives were underway. Network Rail has proposed the creation of regional structures to encourage more local, customer focussed and innovative solutions. As reported in [ORR’s 2017-18 annual health and safety report](#), Network Rail’s risk controls rely on people doing things on time and in the right way. The function of assurance is to make sure that this is what happens in reality. Any failure to build on recent initiatives in improving assurance carries with it risks and will remain a priority for ORR inspectors.

Civils

1.6. We found inconsistencies across the routes in the management of drainage at tunnel portals and higher risk soil cuttings. In the case of tunnel portals we highlighted the need for positive assurance that appropriate was in place. For soil cuttings we found differing levels of drainage management maturity and variable assurance that risks were being managed as low as reasonably practicable. Poor drainage can increase the risk of earthwork failure during periods of high rainfall, which may then cause

derailments. Key to understanding and controlling earthworks risks is knowing the location and condition of drainage assets. Again, we found that asset survey timings and prioritisation of high risk areas varies between routes. Without fully understanding drainage assets, the stability of a structure cannot be properly understood and managed.

- 1.7. More positively, although the year saw slight deterioration in structures examinations compliance compared to 2017-18, there was better sharing of best practice and common issues between the routes. We also found reasonable progress in managing scour risks to structures arising from high water flow. However, we also found that maintenance access to structures was not always prioritised and lack of access opportunities remained an issue.
- 1.8. Related to the above comment on assurance, we found divergence between expectations of Safety Technical & Engineering Directorate (STE) at the centre and delivery in the routes. STE is increasingly not able to direct action and not fully-sighted on route activity to control risks. This makes it more difficult to coordinate action on national matters of concern and it affect STE's ability to monitor compliance with safety-related asset management actions.

Track

- 1.9. Network Rail's central and route focus on track has improved the effectiveness of risk controls on the ground. But these remain vulnerable to environmental factors such as the hot weather seen in summer 2018 that produced a deterioration in track geometry indicators. Many risk controls continue to rely on competent people doing the right things at the right times. Although Network Rail's track risk management has improved, more 'in-depth' arrangements such as enhanced monitoring, auditing and review would allow better measurement of the effectiveness of the risk controls and act as a driver of improvement. This would in turn reduce these vulnerabilities.
- 1.10. Risks from trains hitting objects on the line have reduced over CP5. 2018-19 saw a continued slight fall in risks. Nevertheless, whilst numbers of trains hitting fallen trees have reduced this has been more than off-set by an increase in numbers of animal incursion events. Historically, Network Rail's management of lineside assets has suffered from a lack of good asset data, performance indicators, training, competence and liaison with other disciplines. Our inspections suggest a mixed picture but we are now seeing improvements in risk controls in this area in the routes. We found that risks associated with vegetation (level crossing and signal sighting, low adhesion and signalling wrong side failures) were managed. However, we found weaknesses in some areas such as lack of current at-risk tree surveys, and unstructured training arrangements and competence for staff carrying out tree

inspections. We considered the management of extreme weather in relation to fallen trees, noting that routes should make improvements in this area.

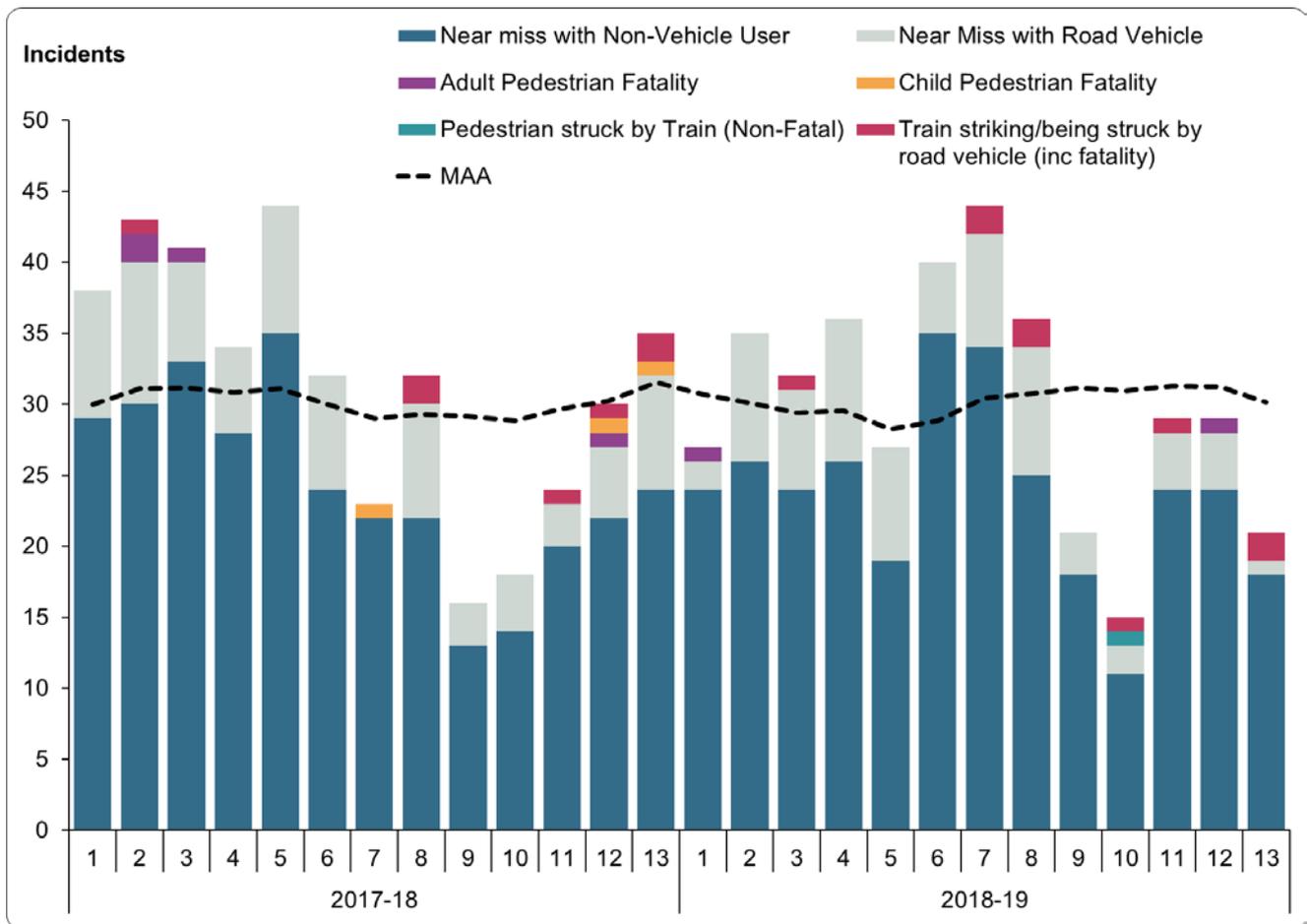
- 1.11. We carried out work on animal incursion and child trespass. Most child trespass happens at unfenced interfaces such as level crossings and platform ends. The solution to this undoubtedly needs to involve Network Rail working with TOCs, British Transport Police and local communities in order to minimise risks. Network Rail continues to proactively tackle trespass through route-based work and the National Trespass Improvement Programme.

Electrical Safety

- 1.12. Network Rail's Electrical Safety Delivery Programme continues to make progress. For example, the Wessex route has been leading the continuing deployment of negative short-circuit devices that improve electrical safety for track workers and reduce the need for workers to place equipment near live tracks. On AC electrification systems, there have been positive developments including initial trials with isolation demarcation equipment and the remote securing project, which is aimed at reducing the risk of inadvertent re-energisation. Nevertheless we continue to see incidents and near-misses involving live electrical equipment. Failure to 'test before touch' and vegetation encroaching on overhead line equipment have featured in our work this year, showing that Network Rail needs to continue to improve its management of electrical safety.

Level Crossings

- 1.13. Level crossings risk reduction work continued to yield modest safety improvements in 2018-19. Despite this, level crossing train accident risk rose in 2018-19, reflecting continued pressure on the network with faster more frequent trains and population growth. Over CP5 Network Rail has achieved around a 25% reduction in modelled level crossing risk. Approximately half of this was achieved through ring-fenced funding provided to Network Rail at the start of the control period. Sadly the year saw two level crossing accidental fatalities. Although this is low in comparison to previous years, numbers of significant level crossing events remained static. These deaths and events underline the need for continued targeted investment in technology and agreed closures to further reduce level crossing risks, particularly at footpath and user-worked crossings in CP6. To that end we successfully challenged Network Rail's proposed approach to funding level crossings improvements in CP6 to ensure that improvements are made wherever reasonably practicable. An important element of this work will be for Network Rail to agree and publish a level crossings strategy. It is concerning that this has remained in draft form for over 12 months.



Operations

1.14. Train accident risk arising from infrastructure operations has seen a modest decline over CP5, although there was a slight rise in 2018-19. The number of operational events including signaller wrong-routings, has steadily risen over the control period. Network Rail needs to understand the factors contributing to this trend, in particular operations staff fatigue, competence and workload.

Workforce Safety

1.15. 2018-19 saw continuing near-misses involving track workers, and the sad death of a track worker at Stoats Nest junction near Croydon in November 2018. Whilst there is no doubt that Network Rail has made some positive changes during CP5 to the way it manages risks, these have tended to concentrate on improving safe systems of work on track through better training, information and supervision rather than avoiding altogether the need to work on open lines or providing improved automatic protection or warning where access is necessary or unavoidable. The 'Planning & Delivering Safe Work' initiative did not deliver any detectable improvements in managing risks to track workers from being struck by trains. Our inspections this year found evidence of the routes adopting differing strategies designed to minimise the

need to go onto live tracks. Some strategies are mandatory, others less-so, and not all apply across the routes. Progress with technology designed to provide enhanced warning or protection is slow but we are seeing roll-out of some solutions. The nature of the network probably demands different solutions for different areas. Until these technologies are fully adopted, and there are robust strategies for minimising live access to the track, Network Rail will continue to rely substantially on workers following systems of work that by their very nature are prone to human error. Nonetheless, Network Rail's newly-adopted 'near-miss reduction programme' has the potential to reduce risks to track workers in the future.

Occupational health

- 1.16. In 2018-19 we focused on risks to workers from silica dust, hand-arm vibration (HAVS) and asbestos. We found that although Network Rail had made some good progress sustained attention was needed. We saw improving compliance with legislation in some areas, but also some inconsistency and poor progress, which has resulted in formal enforcement action by ORR. We served an improvement notice on Wales Route in respect of manual handling matters. However, we found a lack of consistency across and within routes and we took formal enforcement action in LNW route. Considerable work has been carried out, both by Network Rail centrally and by its routes on improving HAVS health surveillance. Progress has been good with high proportions of staff completing health surveillance requirements.
- 1.17. Network Rail now needs to develop its use of health surveillance information. Asbestos surveys have progressed with the benefit of good central direction. However, some of the routes have faltered in delivering work on target, resulting in two improvement notices in the year on Anglia and LNW. Overall, Network Rail centrally has provided assistance and direction for the topic areas. With further proposals for devolution it will be increasingly left to the regions to ensure compliance. The mixed results illustrate the importance of a consistent, managed approach to occupational health. Continued attention is required if compliance is to be improved and sustained.

2. Train service performance

England and Wales performance

Overview of train performance in CP5

- 2.1. Network Rail entered CP5 in April 2014 at much lower levels of performance than anticipated in our Periodic Review 2013 (PR13) and passenger train service performance continued to decline throughout CP5. There was a sharp drop in the 12 months to December 2018. In fact, the industry failed to deliver its planned levels of performance in each of the last nine years. As CP5 progressed it became clear that the national targets of 92.5% Public Performance Measure (PPM¹) and 2.2% Cancellations and Significant Lateness (CaSL²) were unachievable.
- 2.2. Particular issues that caused this decline included the performance of Govia Thameslink Railway (GTR) during 2016-17 and the problems related to the May 2018 timetable changes, which had a particularly severe effect on GTR, Northern Rail and TransPennine Express (TPE).
- 2.3. Our approach to monitoring and enforcement of train performance in CP5 has evolved accordingly. In the first two years of the control period we took an 'input' based approach, focusing on the actions Network Rail was taking to improve performance and placing less weight on the actual performance targets. As part of the shift towards regulating Network Rail's devolved business units at route level we increased our focus on locally agreed targets, reflected in performance strategies and agreed through the annual scorecard process.
- 2.4. In response to Network Rail's ongoing under delivery of performance to passenger train operators, we undertook a number of specific interventions:-
 - In 2015, we found Network Rail to have breached licence condition 1 of its Network Licence in relation to Southern and GTR. Network Rail agreed to make reparations in lieu of a fine.
 - We closely scrutinised Network Rail's delivery to Southeastern in 2017 and South Western Railway (SWR) in 2018 due to the failure of their locally agreed

¹ PPM is the Public Performance Measure. This measures the number of trains that arrive within 5 minutes (10 minutes for long distance operators) of the published time at its final destination.

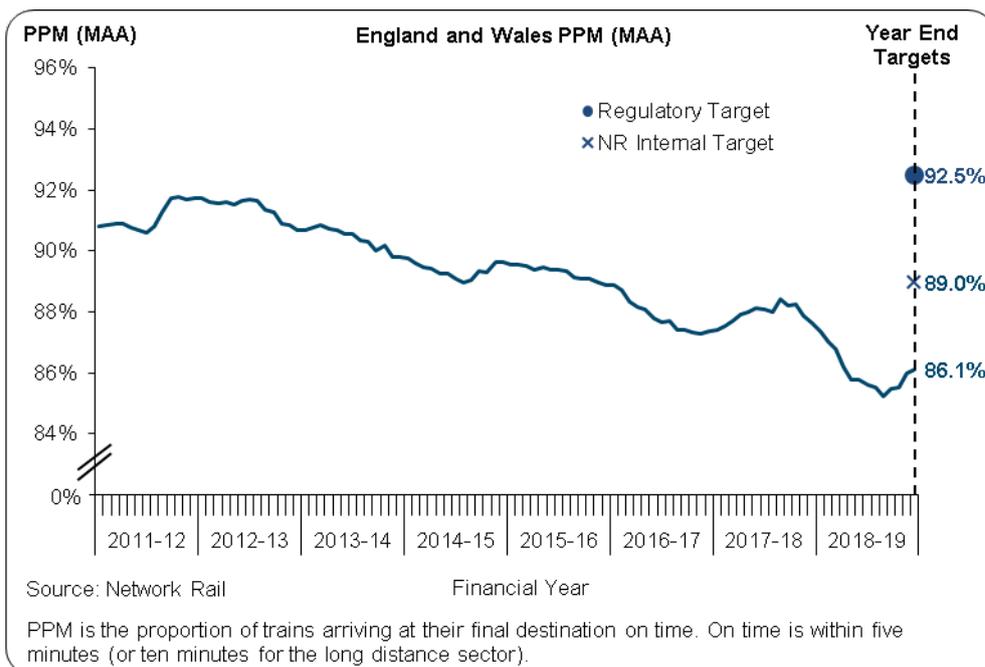
² Cancellations and Significant Lateness is the proportion of trains which fail to run at all or fail to call at booked stops or arrive at their final destination 30 minutes or more later than planned.

performance targets. In both of these cases, we concluded that Network Rail was doing everything reasonably practicable to deliver for these operators.

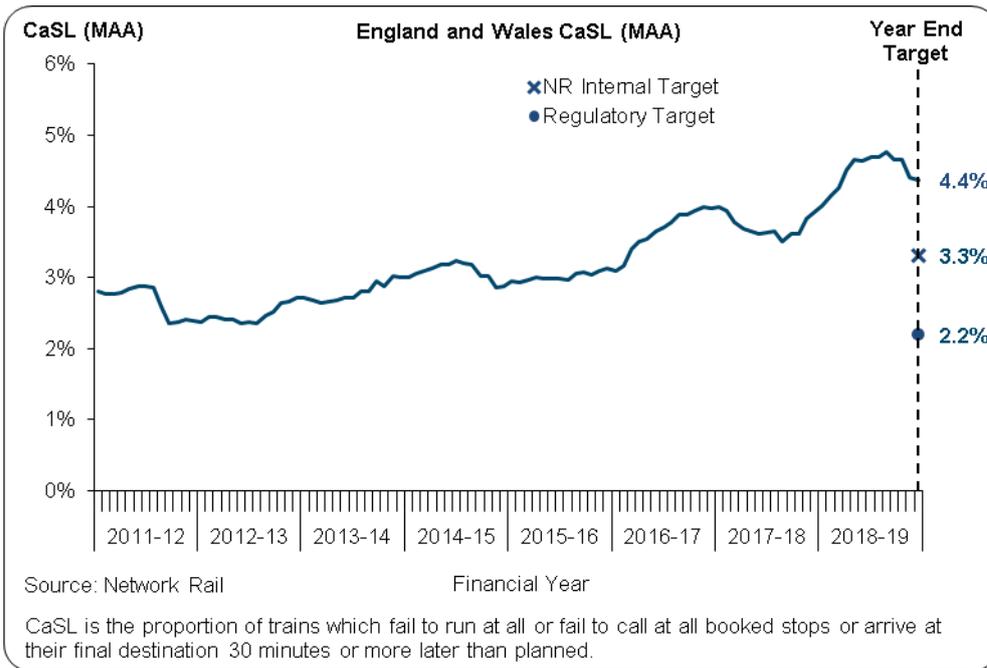
- In November 2018, we took further formal enforcement action and issued a Provisional Order in respect of Network Rail’s performance management capability, which we found to have been weak, contributing to the lowest levels of train service performance in CP5. In its response, Network Rail provided us with an acceptable plan to address this which satisfied the obligations of the provisional order.

Passenger train service performance in 2018-19

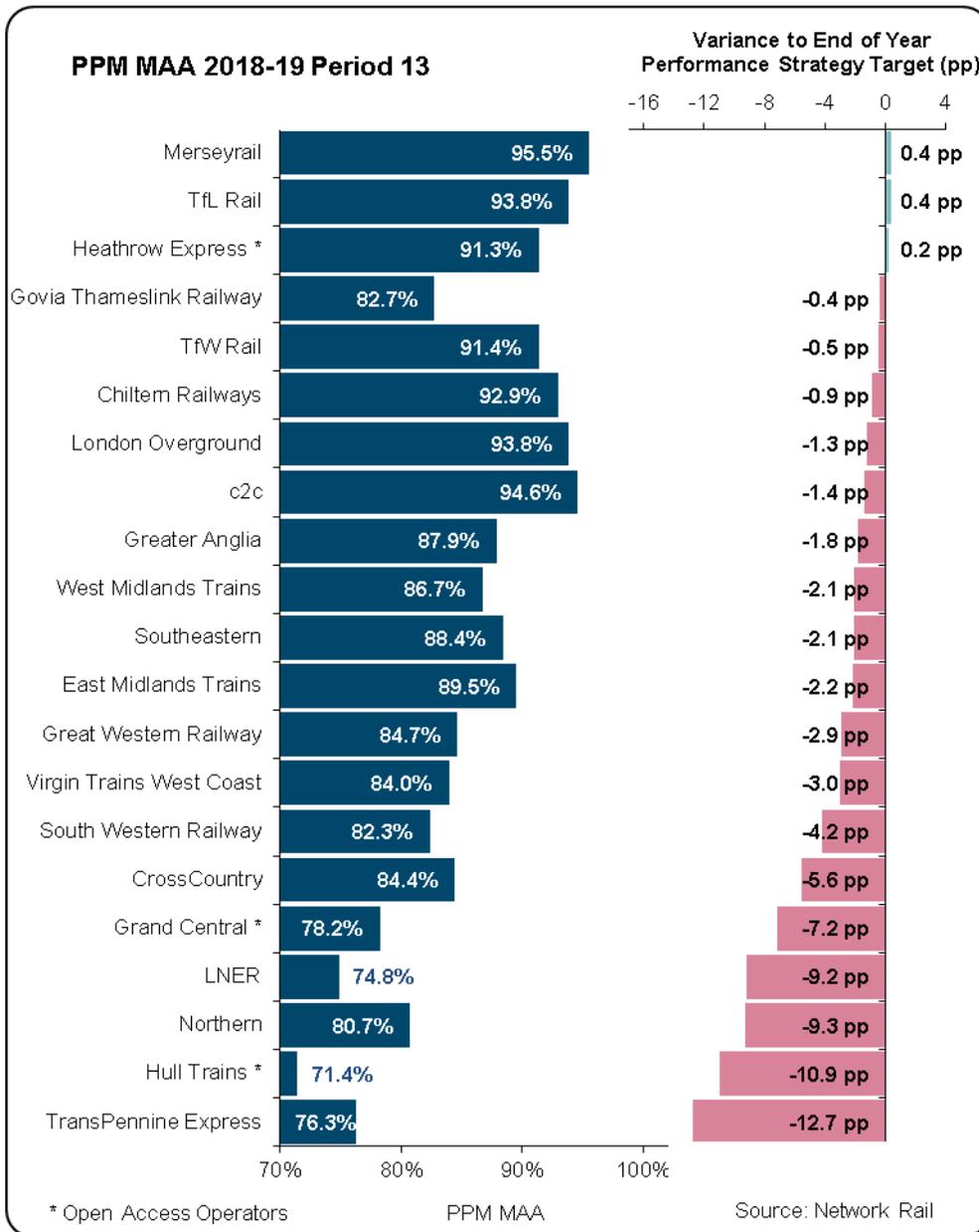
2.5. At the end of period 13 of 2018-19, in England and Wales, the PPM MAA stood at 86.1%. This was 2.9 percentage points (pp) below Network Rail’s year-end internal target and 6.4pp below its regulatory target. It improved towards the latter part of the year, driven by performance delivery improvements to Great Western Railway, TPE and Northern.

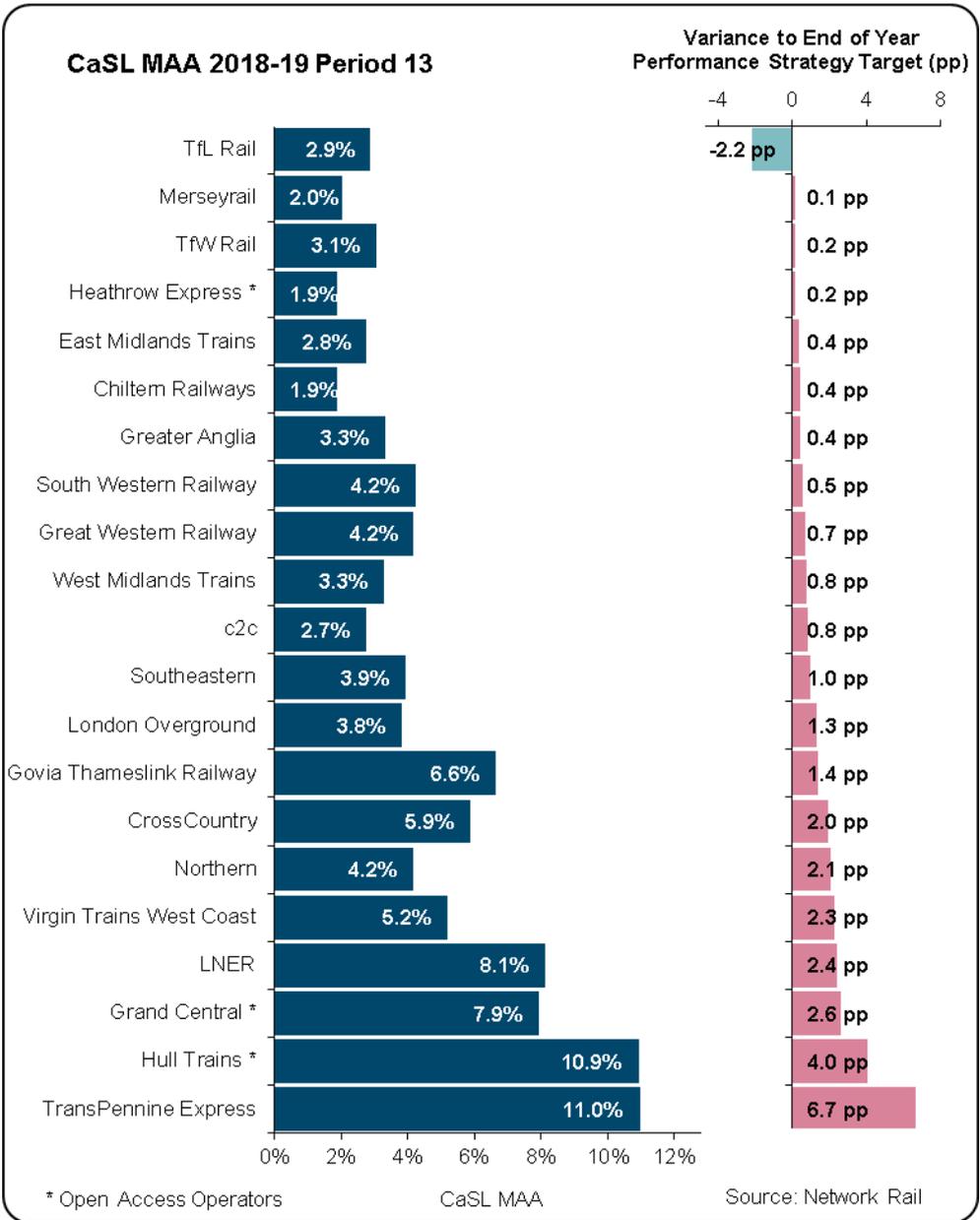


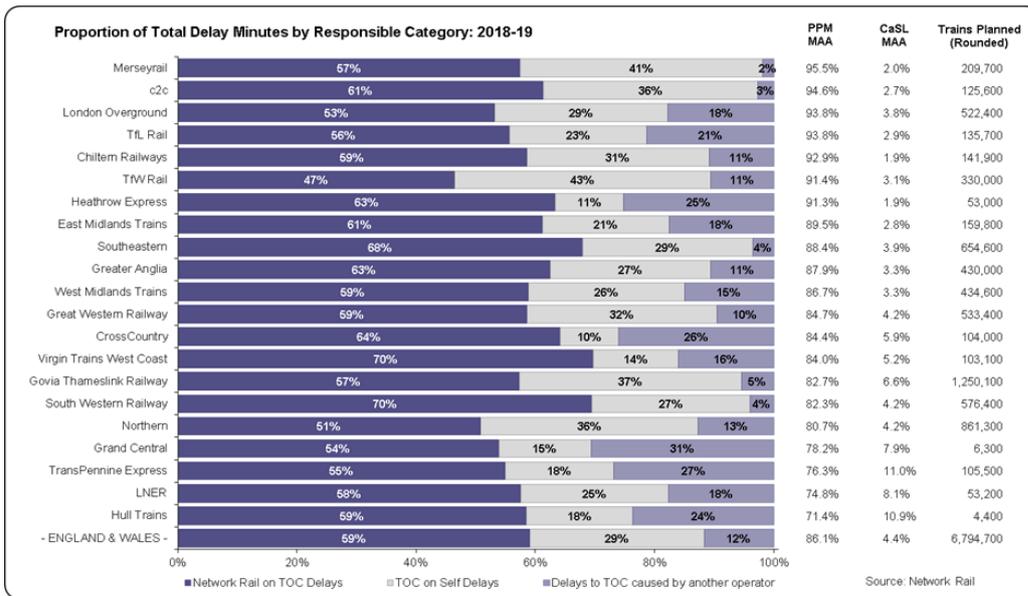
2.6. The CaSL MAA increased (worsened) to 4.4%. It is now 1.1pp worse than Network Rail’s year-end internal target and 2.2pp worse than the regulatory target. Again, there was an improvement towards the latter part of 2018-19.



2.7. One passenger train operator, TfL Rail, delivered both its locally agreed targets for PPM and CaSL for 2018-19. At the end of period 13, Merseyrail recorded the highest absolute PPM MAA score (95.5%) and Chiltern Railways and Heathrow Express had the lowest (best) CaSL MAA of 1.9%.







- 2.8. All eight of network rail's geographic routes underperformed in relation to their central target of 50% on the route comparison scorecard.
- 2.9. We have been particularly concerned at underperformance for SWR, Northern and TPE. To understand performance trends we have analysed data provided routinely by the industry and undertaken regular site visits to see at first hand the challenges Network Rail faces and how it plans to tackle them.
- 2.10. Northern and TPE performed very poorly in 2018-19 having been impacted significantly by the May 2018 timetable changes. Their performance has improved following the timetable changes in December 2018.
- 2.11. In Wessex route, the management team is making determined efforts to improve performance establishing a joint performance improvement centre in December 2018 at London Waterloo.
- 2.12. South East route achieved the highest total achievement of all routes of just 0.1% below target despite a highly problematic timetable change for GTR in May 2018.
- 2.13. The worst performing route was in England and Wales, LNE & EM at 28.1% below target. The route was impacted significantly by the timetable problems in May 2018. Delays consistently hit TPE and Northern services until the changes made in December 2018.
- 2.14. Improvements were also evident in Western's performance delivery towards the end of 2018 following substantial completion of project works resulting in reduced disruptive access and delivery of performance benefits associated with the enhancements.

2.15. Performance in 2018-19 was affected by factors including:

- **Weather:** Summer 2018 saw sustained periods of hot weather. The impact of these weather conditions caused additional signalling failures, track faults (and resulting speed restrictions) and buckled rails. It prevented Network Rail from safely undertaking routine maintenance activities, such as tamping.
- **Issues implementing the May 2018 timetable change** – This was affected by delays to enhancements and issues with traincrew diagrams. This had a severe impact on many operators and their customers, notably GTR (Thameslink and Great Northern routes) and Northern. However, some of this performance loss was recovered later in the year.

Formal Enforcement - Provisional Order (train service performance)

2.16. The performance decline described and associated emerging performance challenges prompted several independent reviews of specific areas of the network to better understand underlying causes and make recommendations for improvements. The findings of these reviews as well as our own reviews of Network Rail's performance delivery to Southeastern and SWR led us to undertake formal enforcement action in November 2018.

2.17. We issued a [Provisional Order](#) under section 55 of the Railways Act 1993, requiring Network Rail to 'engage and work with train operators; and deliver a report to ORR detailing how it is identifying the common underlying issues relating to performance planning and service recovery; and addressing and implementing the conclusions of its report going forward into CP6'.

2.18. The main purpose of the order was to ensure urgent action to understand and address the performance decline evident throughout CP5. It was a necessary, proactive step to avoid further deterioration of performance into CP6 resulting in a piece of long overdue work in the industry to understand the drivers of performance outcomes.

2.19. Network Rail responded positively and submitted a thorough [response](#) detailing how it intended to tackle the systemic issues. We will monitor Network Rail's implementation of this and have incorporated this new element into our framework for holding the company to account. We continue to focus on Network Rail's delivery for passengers and will report publicly on these and where TOCs action are not keeping pace.

2.20. Whilst we have formally confirmed that Network Rail has [satisfied the obligations](#) of the Provisional Order it is the implementation of the reports' findings, plans and commitments that is critical to securing the necessary improvements in train service performance.

Network capability

2.21. Network capability' describes the capability of the network in terms of track mileage and layout, line speed, gauge, route availability and the amount of electrified track. Our CP5 Final Determination required Network Rail to maintain (subject to network change) the baseline capability for which it is funded for the benefit of its stakeholders. For CP5, we said that the baseline capability of the network would be that in place as at 1 April 2014.

2.22. We had some concerns about Network Rail's delivery in this area and its ability to adhere to accepted industry processes. In response to stakeholder concerns and its own internal audit, Network Rail carried out a review of its processes and developed improvement plans. We commissioned Arup, as an Independent Reporter, to review CP5 Network Capability nationally and make recommendations regarding monitoring of Network Capability in CP6. Arup concluded that Network Rail's processes were delivering its obligations in CP5 and made a number of recommendations including creating a dashboard of measures to track Network Capability relevant KPIs. We will continue to monitor these outputs at an industry steering group.

Network availability

2.23. Network availability is an important passenger and freight end-user outcome. Network Rail should balance the level of disruption to passengers and freight customers, and the level of planned engineering work necessary to maintain, renew and enhance the network. In CP5, Network availability was measured using the Possession Disruption Index (PDI) for Passengers (PDI-P) and Freight (PDI-F).

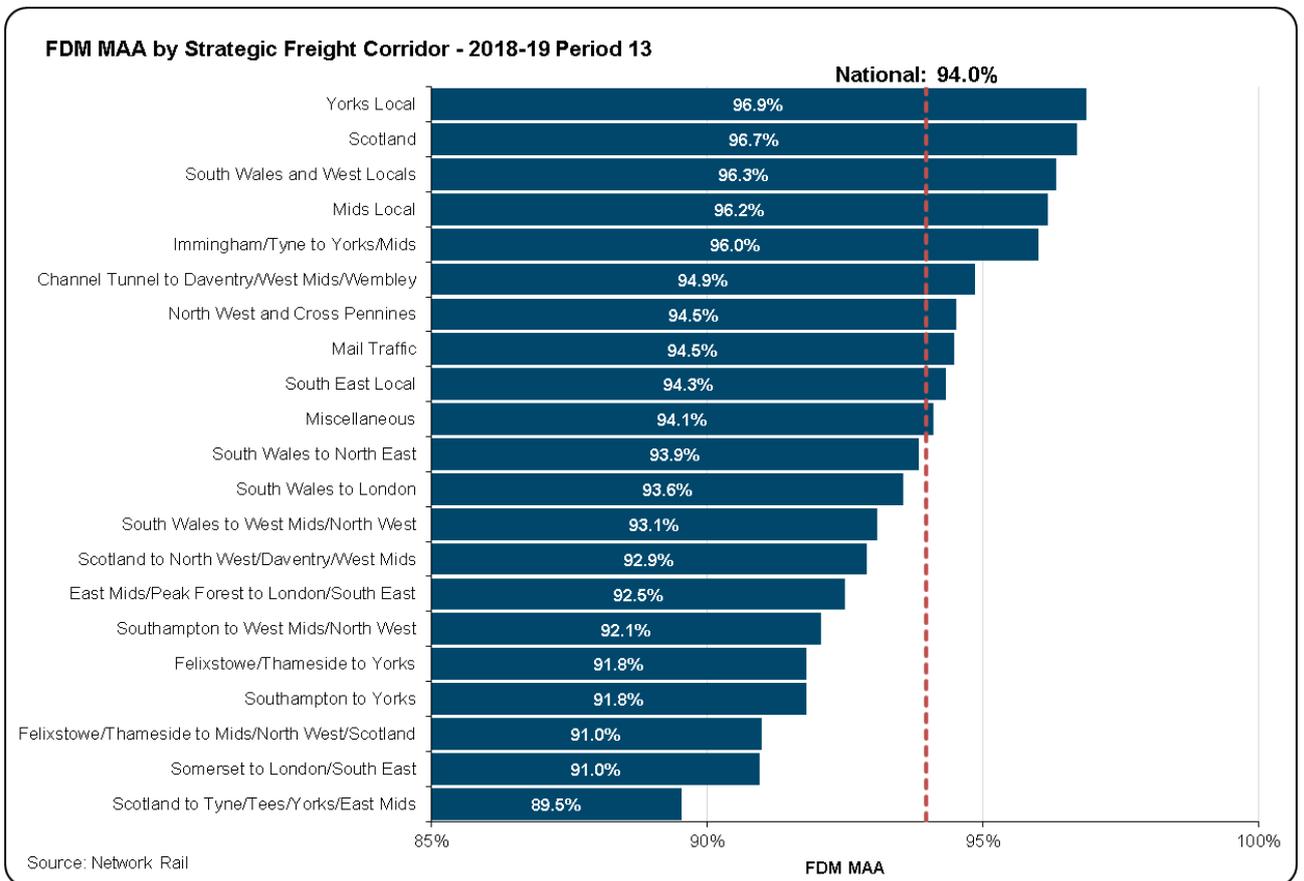
2.24. We undertook an extensive exercise to determine what Network Rail's customers thought of its delivery in this area. We also employed consultants SNC Lavalin to advise on the best way of assessing network availability in CP6. On the basis of that advice we discontinued PDI-P and PDI-F and they are not being used in CP6. Instead we will use a suite of measures put forward by Network Rail that taken together will give a clear picture of how effectively it is managing in this area.

Freight performance

2.25. The regulatory performance measure for freight is the Freight Delivery Metric (FDM). This measures the percentage of freight trains arriving at their destination within 15 minutes of scheduled time. FDM covers delays attributed to Network Rail - i.e. not

those caused by freight operators. The FDM MAA at the end of 2018-19 was 94.0% 1.5pp ahead of the regulatory target of 92.5%.

2.26. We are continuing to liaise with the Freight and National Passenger Operators (FNPO) route to gain assurance that this level of performance is sustained and that the FNPO route will continue to deliver for freight and national passenger operators whose operations cross the geographic routes.



Timetable changes

2.27. The May 2018 timetable change led to significant disruption for passengers in some parts of the network. We have recently written to Network Rail setting out [lessons learnt on the timetabling process since May 2018](#). Since May 2018, the December 2018 and May 2019 timetables have been delivered successfully, representing a huge effort across industry to learn lessons from May 2018.

2.28. An industry Programme Management Office (PMO) was set up by Network Rail following May 2018 to provide a robust and collaborative joint industry mechanism to identify and address risks and issues that arise in relation to timetable change. In our view, it is that this has increased the confidence in delivery of the timetable and

resulted in a more effective process for the identification and reporting of system wide risks to the timetable. The PMO processes have evolved over the last 12 months and they have generally worked well, however we would expect them to continue to evolve and mature over time. Following May 2019, the PMO has carried out its own lessons learnt exercise and will be making changes to its processes to reflect this and ensuring its processes are embedded into the business as usual activity of producing the timetable.

2.29. Network Rail has built upon recommendations in our [independent inquiry](#) and [enforcement action](#) to make further positive changes. We have welcomed the work undertaken in the last year by Network Rail's System Operator (the SO) to increase its capability to produce the timetable, including putting in place significant levels of new resources. The SO is also leading on work to review Part D of the Network Code, which sets out the procedure and timescales for developing the timetable, and to use increased capital expenditure to fund improvements in data, train planning systems, access planning and whole system modelling.

2.30. Further, in April 2019 informed traveller timescales, which had broken down in the run up to May 2018, were recovered across the network, except for GTR which continued to consistently bid late. This was consistent with the recovery plan Network Rail put in place in summer 2018. Network Rail has put in place a revised recovery plan for GTR and this is on track. We recognise the hard work that has been put in across Network Rail and industry to achieve this.

Monitoring Train service performance in CP6

2.31. We published a [revised framework](#) for holding Network Rail to account in CP6 which focuses on routine monitoring and assessment, inter-route comparison and early resolution of concerns to protect rail users from the outset. It places more emphasis on collaborative working and stakeholder engagement to incentivise Network Rail to deliver for its customers and passengers and maximise the benefits of devolution.

2.32. We will monitor and assess train service performance through three "lenses", that we will consider together and not in isolation:

- how Network Rail's geographic routes, SO and FNPO are delivering against their own **scorecards**, which are agreed with customers annually;
- how Network Rail is delivering against two **consistent route measures**, one for freight and one for passenger services. We also set a requirement for a national level freight measure, the Freight Delivery Metric, reflecting the national nature of freight markets; and

- how Network Rail's component parts are retaining a focus on **reactionary delay and reliability** (i.e. cancellations) as well as punctuality, which Network Rail will regularly report on.

Route scorecards

2.33. Network Rail introduced route scorecards in 2014-15 to monitor its key performance indicators and to deliver its commitments to meeting customers' requirements.

2.34. Scorecards are complex and contain a large number of measures. We intend to focus on consistent route measures and 'train operator level' measures, rather than looking at more detailed measures but we may consult/refer to alternative measures and indicators to support any review or investigation of Network Rail's delivery.

2.35. We set expectations in PR18 around governance and behaviour of both Network Rail and train operators in agreeing performance targets. For 2019-20 all the train operator customers have agreed performance targets with routes, except for TPE, whose lead route is LNW and Northern whose lead route is LNE & EM. These targets are chosen from a suite of metrics, such as 'On Time at All Stations', Cancellations, and 'Punctuality to Three minutes'. These new measures seek to change focus solely from PPM as a performance measure and have been developed by the industry to better reflect the passenger expectations. We use the data in the scorecards as evidence to help us determine whether Network Rail is doing everything reasonably practicable to meet its train service performance targets.

Consistent route measures

2.36. We will also focus our routine monitoring and assessment on two measures that we set in the Final Determination. These are:-

- a consistent route measure for passenger services known as CRM-P. This is all of the delay minutes to passenger services attributed to each Network Rail route, normalised per 100 train kilometres; and
- a freight delivery metric for each route known as FDM-R. This is a measure of Network Rail's ability to get commercial freight services to their destination within 15 minutes of scheduled time.

2.37. We also set a requirement for national FDM, reflecting the national nature of freight markets.

2.38. For each of these measures we monitor delivery against the annual target for each route and the regulatory floor for each route. The floor is set below the target and signals the point at which we are highly likely to formally investigate.

2.39. We will report on both measures publicly in CP6 editions of the monitor. This public reporting will be based on a 'league table' approach, i.e. which routes are doing better than others.

Reactionary delay and reliability

2.40. CRM-P focuses on delay attributed to Network Rail. It does not reflect reactionary delay from train operator-caused incidents. Network Rail, as infrastructure manager and SO, is responsible for recording and managing delay from all incidents regardless of cause and culpability. There is a risk that our monitoring of CRM-P could have the unintended consequence of reducing the relative attention given by Network Rail to management of reactionary delay caused by others, which would not be in the interests of passengers or freight users.

2.41. Network Rail reports reactionary delay to the National Task Force, which reviews it, and other industry groups. Network Rail will increase the visibility of this reporting within the company and with train operators in CP6. We have required Network Rail to go further by reporting this publicly in CP6, including comparative information about reactionary delays by cause and operator type. We also require this report to include cancellation data.

2.42. We are monitoring levels of reactionary delay and will intervene if evidence emerges that Network Rail is not adhering to its commitments to manage these issues effectively.

Performance management capability

2.43. As discussed, Network Rail has met the requirements of the Provisional Order relating to its performance management capability based on its response and report of 15 February 2019.

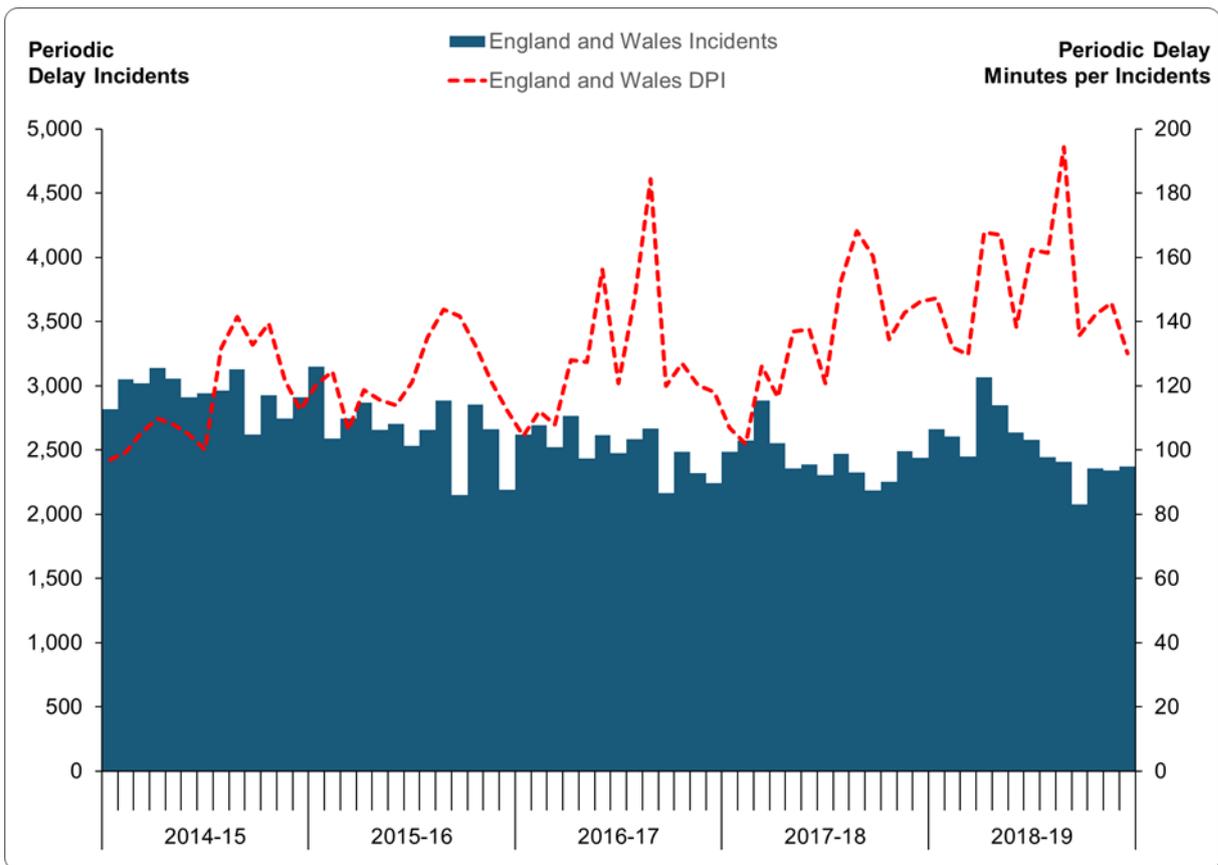
2.44. This intervention has presented a key opportunity for the industry to identify and deliver the components of good performance by enabling more focus on inputs and leading indicators for train service performance rather than relying on solely on performance outcomes.

2.45. It is our intention to hold Network Rail to account against its commitments to improve performance management capability and we have developed a focused monitoring plan to achieve this as part of our routine monitoring and assessment. In addition to Network Rail's role to lead performance management and improvement in the industry we will closely observe whole industry endeavours to drive a step change in performance management/ outcomes and report progress in the next monitor.

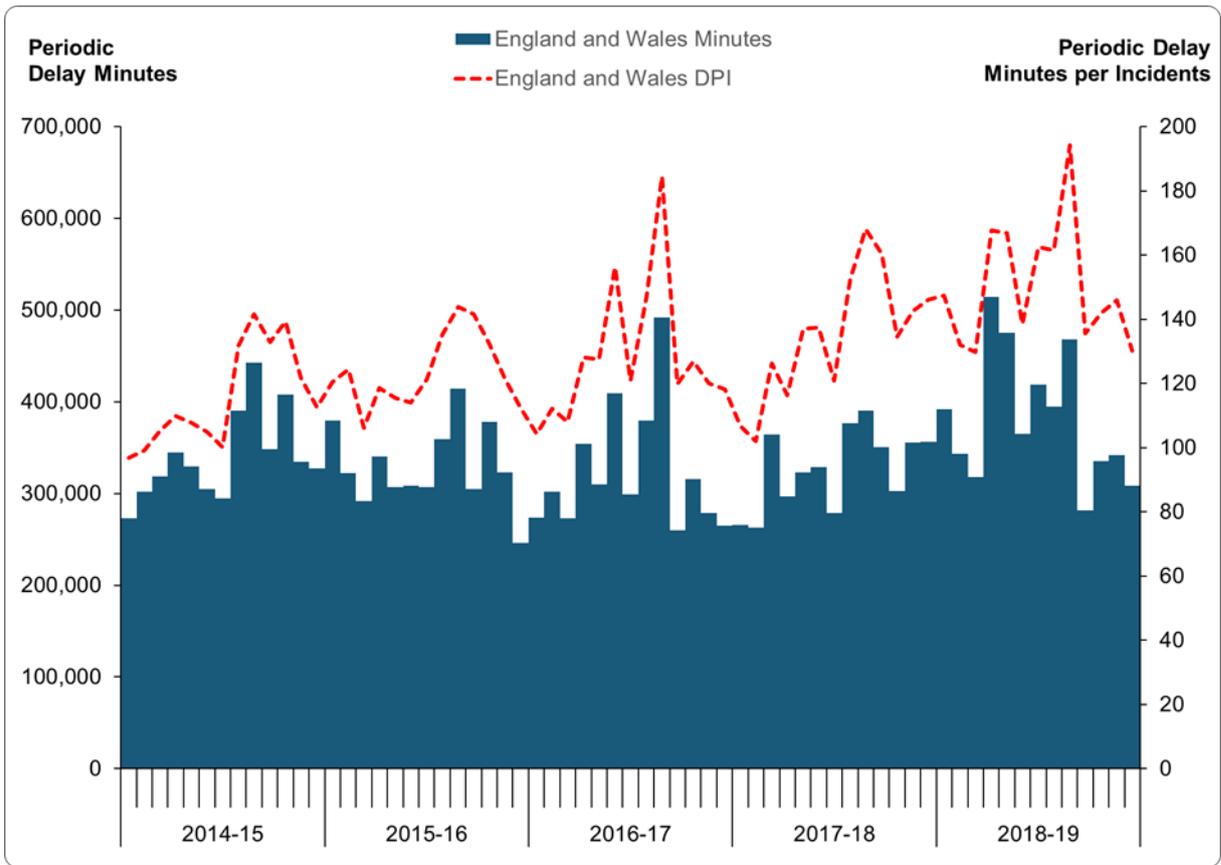
3. Asset management

Asset performance

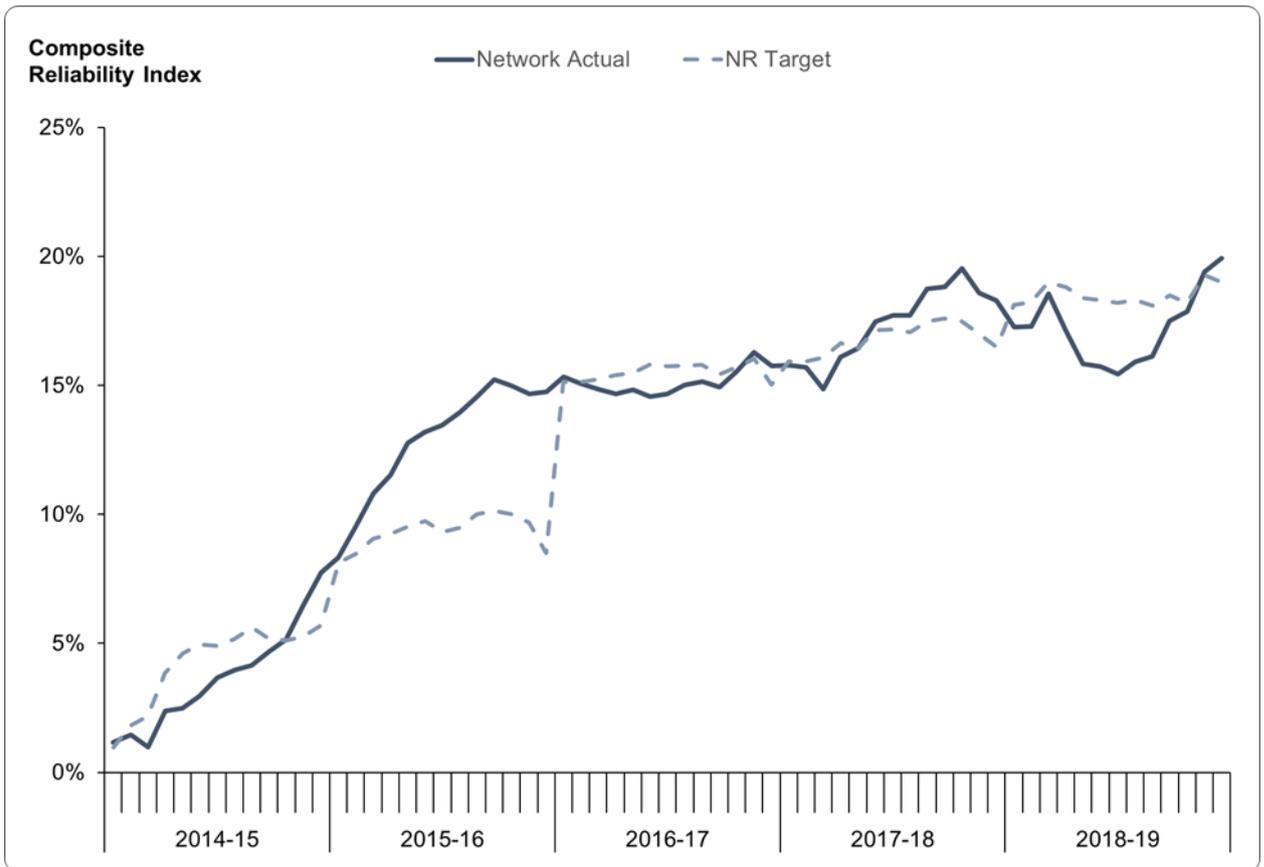
3.1. After a poor start to the year, overall asset performance in England and Wales improved in periods 8 to 13 of 2018-19. At the end of the year asset performance was comparable to that achieved at the end of the year. The number of infrastructure-related delay incidents reported in the periods were broadly similar to that reported in 2017-18 and recovered from the first half of the year.



3.2. However, the summer and autumn saw a higher number of incidents causing lengthier delays. This was partly driven by track faults and quality of the track causing speed restrictions associated with the hot summer of 2018.



3.3. The Composite Reliability Index (CRI) measures asset performance and the short-term condition of key assets – track, signalling, points, electrification, telecoms, buildings, structures and earthworks. CRI is measured against the baseline set at the start of CP5. While CRI across the network has lagged behind target (see below) for the majority of 2018-19, Network Rail finished the year 0.9pp ahead of target, equating to a 19.9pp improvement over the whole control period



3.4. In 2018-19 the contribution of track and signalling to the CRI improved, although it was consistently below target. Earthworks, points and telecoms saw upwards movement in periods 8 to 13 of 2018-19 and ended the year better than target. Buildings, Electrification & Plant (E&P) and structures stayed consistently above target throughout the year. All assets finished the year with positive contributions to the CRI.

Composite Sustainability Index

3.5. Maintaining and renewing the network in the short-, medium- and long-term to meet reasonably foreseeable future demand for railway services is one of the key obligations set out in Network Rail's Network Licence. We have mandated a consistent route level measure of network sustainability in order to help us assess Network Rail's progress against this important outcome. This measure is the Composite Sustainability Index (CSI). CSI was developed by Network Rail before the start of CP5 to monitor changing patterns of asset life and some aspects of asset performance and risk. It uses models that measure changing asset life by analysing patterns of degradation and improvement from interventions. The CSI itself is the percentage change in the residual asset value. In England and Wales over the

course of CP5 there was a small loss of -0.13%. Route comparison data for CP5 can be found [here](#).

- 3.6. Whilst CSI is a useful measure, we consider that it has potential for further improvement. Following the publication of our Final Determination and Network Rail's acceptance, Network Rail has worked on updating its model for the calculation of the remaining asset value or asset condition score. The model was not ready for the start of CP6 and we continue to work with Network Rail on how it will be integrated and presented in the most effective format. Routes have used the current model for creation of their objectives within the 'Route Strategic Plans'. The CP6 forecasts were set in line with the Final Determination and will be updated via the change control process to reflect CP5 actuals and RF11 Delivery Plan submission.
- 3.7. The number of track service affecting failures in periods 8 to 13 of 2018-19 reduced (i.e. improved) from the mid-point of the year, at which track failures were at a control period high. Since the beginning of 2017-18 the number of rail breaks and immediate action defects has been relatively stable at around two per 100km.
- 3.8. The beginning of period 8 saw the reported percentage of poor track geometry across England and Wales at a control period high. The hot and prolonged summer of 2018 had lasting effect in part due to deferral of maintenance interventions during that time. The measure steadily improved but ended the year at levels under that achieved at the end of 2017-18.
- 3.9. Overall signalling performance improved in periods 8 to 13. Period 10 saw the lowest amount of signalling incidents reported in the control period. Telecoms failures continued to reduce over the control period, and periods 8 to 13 saw the lowest level of failures within the control period. Civil engineering structures, earthworks and buildings delay incidents were consistent with previous years. AC traction power supply failures in periods 8 to 13 were consistent with those experienced in 2017-18. DC traction supply incidents increased in periods 8 to 13 compared to 2017-18.
- 3.10. Although failures have been decreasing, the amount of delay minutes per incident continued to rise, leading to a similar pattern of total delay minutes across the control period.

Significant incidents

- 3.11. In periods 8 to 13, there were several notable asset-related incidents, causing delays to the operation of trains on the network. Examples included an over-line bridge strike on LNW route causing line blockages and imposed Emergency Speed Restrictions, track circuit failures on South East route due to shorting from redundant

rail bolts and damage to the overhead line equipment (OLE) at Lichfield North on LNW route, causing trains to be stranded and lines to be blocked.

3.12. These large scale incidents highlight the importance of appropriate asset management, defect identification and incident response capabilities.

Renewals volumes

3.13. We monitor the volume of work completed by Network Rail, so we can hold the company to account for achieving its current plan, and understand the volume of work deferred from Network Rail's CP5 Delivery Plan. Through their scorecards, routes are measured against;

- plain line track;
- switches and crossings (S&C);
- signalling (SEUs);
- underbridges;
- earthworks (embankments, soil and rock cuttings);
- OLE wire runs; and
- conductor rails.

This covers around half of the overall renewals portfolio, but captures work on assets which, should they fail are most likely to impact passengers and freight customers.

3.14. Network Rail exceeded its planned delivery of physical volumes for all assets in 2018-19 against its delivery plan. Of note, plain line volumes exceeded their delivery plan by 39%, whilst S&C volumes also exceeded by 30%. However, this metric rolls up many types of interventions with the same weighting and much of this exceedance comes from lower classes of interventions (i.e. medium refurbishment, rather than full asset renewal).

3.15. All routes in England and Wales achieved a minimum of the 95% target for the delivery of the seven key volumes against their delivery plan.

Our identified areas for improvement

3.16. We have identified a number of areas for improvement in Network Rail's asset management capabilities.

- 3.17. Network Rail's vegetation asset management capabilities were brought into focus following storms across 2013-14 that brought down a number of trees, impacting performance and potentially safety. Network Rail's initial focus was on securing funding for compliance with standards through route vegetation management plans, whilst also improving asset data. Network Rail has appointed a Head of Lineside to focus on managing boundary, vegetation and other lineside issues. Periods 8 to 13 saw some encouraging responses from routes and now going in to CP6 Network Rail is working on creation of prioritised plans and developing measures to quantify work and benefits.
- 3.18. We raised concerns around the consistency and quality of Network Rail's track geometry maintenance in 2016. Since then, routes have been implementing better management systems to address the underlying causes of track geometry faults. To date, South East, LNE&EM, Western and Wessex have shown satisfactory progress in addressing our concerns and we continue to monitor the remaining routes.
- 3.19. A legal requirement of the Energy Technical Specification for Interoperability (TSI) is that projects must be dynamically tested before being authorised to run above 75mph. During the control period, Network Rail's projects have reached commissioning stage without a scheduled means of carrying out this test. This has subsequently led to increased costs for last minute procurement of trains and detrimental effects on the timetable due to reduced running speeds where testing it has not been achieved on time. Plans have now been agreed for all projects leading up to 2020 and Network Rail plans to develop its own in-house dynamic testing capability.

Digital Railway

- 3.20. As part of the Digital Railway programme, Network Rail was required to deliver a long term deployment plan (LTDP) for the provision of European Train Control System (ETCS) nationally for the Department for Transport (DfT). The first version was completed in February 2019 and it is now with DfT for consideration as part of CP6 enhancement plans and future renewals. Meanwhile, all major signalling renewals will be designed ETCS ready in preparation for future rollouts.
- 3.21. Our CP6 determination included some costs for Digital Railway activities, but signalling renewals are predominantly to be conventional unless additional funding is provided by DfT to allow for the migration to ETCS across England and Wales.
- 3.22. On the network, Thameslink now has ETCS/ Automatic Train Operation functionality through the core section (recently extended to London Bridge). However it is not yet in use for passenger service as GTR driver training is required first A plan for GTR

driver training is in place to enable the implementation of the May 2020 timetable change. Network Rail's LNE&EM route is preparing to take over the leadership of delivery of ETCS south of Peterborough.

CP5 Outputs

3.23. For CP5, we developed a framework based on outputs, indicators and enablers.

Four outputs were identified;

- asset management excellence model (AMEM) capability for each core group at National level;
- asset data quality for each asset type at National level; and
- milestones for ORBIS (Offering Rail Better Information Services).
- Station Stewardship Measure (SSM)

Asset Management Excellence Model (AMEM) capability

3.24. Prior to the beginning of CP5, Network Rail measured its asset management maturity using Asset Management Consulting Limited's AMEM. Our CP5 determination set Network Rail targets to improve its capability by the end of CP5 to achieve a score of 72% \pm 2% at 80% confidence against six core subject groups used within the AMEM framework.

3.25. As described in our CP6 Final Determination, Network Rail achieved the 72% target in three of the six groups of asset management within the specified confidence limits. We recognised that these scores demonstrated a good level of capability maturity and expected Network Rail routes to demonstrate further how they were improving their asset management capabilities and operate within the requirements of ISO55001, the international standard covering management of assets of any kind.

Asset data quality

3.26. Both the development and application of asset policy, and the use of advanced decision support tools, are heavily reliant on Network Rail maintaining a comprehensive and reliable dataset of information about all the network assets and their condition. As part of our PR13 assessment we evaluated the quality of Network Rail's asset data and found it variable. So for CP5 we set Network Rail the objective of delivering an improved asset dataset, and we made it a regulated output to be achieved by April 2017, to support the planning process for PR18. We said Network Rail should demonstrate A2 data quality for the core asset data used in asset management decision making, which means it should be maintained by an

overarching information management system (A), and that the data itself should be appropriately accurate and reliable (2).

- 3.27. We have previously determined that all assets had achieved the 'A' grade for governance. Network Rail's internal assurance processes indicated that as of April 2017, all assets had met or maintained a level '2' requirement for data accuracy apart from telecoms and E&P which received '3' and '4' respectively.
- 3.28. Network Rail's internal assurance processes indicated that over the course of CP5 the data quality for Structures and Earthworks attributes improved to level '2' and has therefore met the target set in our CP5 final determination. We commissioned independent reporter assurance of this conclusion. The project is in progress at the time of publishing this monitor, however the indications from the pilot stage are supporting Network Rail's assessment of a grade of '2' for Structures and Earthworks.

ORBIS milestones

- 3.29. Offering Rail Better Information Services (ORBIS) was a programme aimed at improving asset management capability through improved information management. It involved adopting consistent data specifications, providing simpler mobile data capture tools, replacing out-dated asset information systems, and providing improved decision support tools. For CP5 we set out specific regulatory outputs based on key milestones in Network Rail's programme.
- 3.30. Network Rail met these milestones, until June 2016 when it missed the milestone for replacement of the existing Civils Asset Register and Reporting System (CARRS) with a new Ellipse-based asset management system for civils structures known as CSAMS (Civils Structures Asset Management System). The milestone for decommissioning of GEOGIS (Geography and Infrastructure System), its legacy system was also missed later that year.
- 3.31. GEOGIS's replacement, the Infrastructure Network Model (INM), went live in September 2017. GEOGIS was subsequently decommissioned on 7 August 2018.
- 3.32. CSAMS has not yet been delivered. Network Rail has experienced supply chain difficulties and we are awaiting a new proposed delivery date. We required Network Rail to propose mitigations for the late delivery of CSAMS to satisfy a number of open Rail Accident Investigation Branch recommendations. This requires provision for a joined up view of key asset information, allowing for more effective and efficient asset evaluation.

Station Stewardship Measure

3.33. Station Stewardship Measure (SSM) is an average condition score of stations in each of the station categories A to F in England and Wales³. A lower SSM score indicates a better station condition. In our PR13 Final Determination, we set SSM targets as a regulated output for Network Rail.

	2014-15	2015-16	2016-17	2017-18	2018-19
Category A					
Actual	2.05	2.07	2.06	2.04	2.05
Target	2.24	2.24	2.24	2.09	2.23
Category B					
Actual	2.29	2.28	2.28	2.29	2.27
Target	2.34	2.33	2.33	2.31	2.32
Category C					
Actual	2.35	2.35	2.35	2.33	2.31
Target	2.40	2.40	2.39	2.37	2.38
Category D					
Actual	2.33	2.34	2.34	2.32	2.32
Target	2.40	2.39	2.39	2.37	2.38
Category E					
Actual	2.35	2.35	2.35	2.35	2.35
Target	2.40	2.40	2.39	2.38	2.39
Category F					
Actual	2.43	2.43	2.42	2.41	2.43
Target	2.48	2.47	2.47	2.45	2.46

3.34. In England and Wales, Network Rail managed to exceed all targets.

Deferral of Renewals

3.35. In late 2015, Network Rail completed a re-planning exercise led by Sir Peter Hendy which established a rescheduled plan of England and Wales project milestones for CP5. Alongside this re-plan, Network Rail reduced the volume of renewals it planned to deliver during the remainder of CP5 due to affordability constraints. We reviewed Network Rail's revised plans to assess their impact on the condition and performance

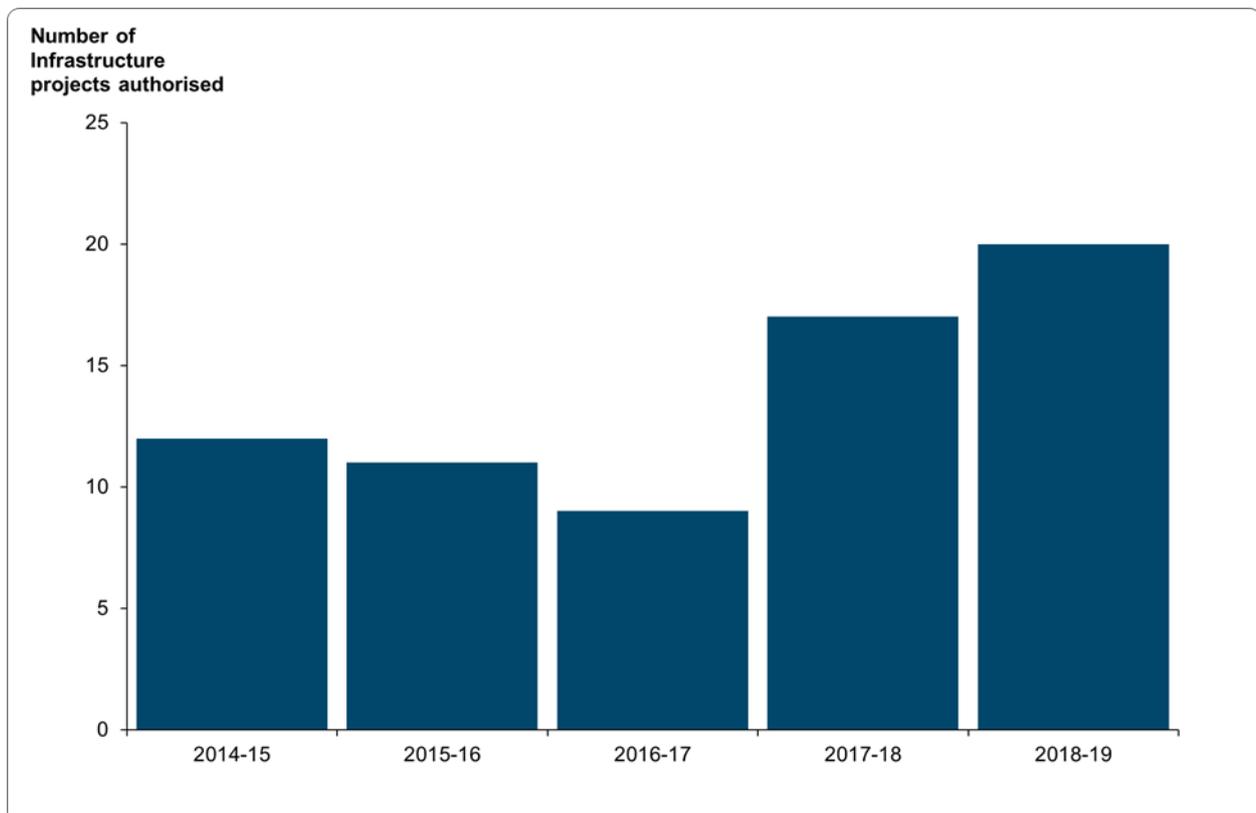
³ The Department for Transport categorises stations into National Hub (category A), Regional Interchange (category B), Important Feeder (category C), Medium Staffed (category D), Small Staffed (category E) and Small Unstaffed (category F).

of the assets. We raised concerns about the impacts on earthworks, drainage and structures. Network Rail sought to mitigate these impacts through increased levels of maintenance.

3.36. The performance reported at the end of the control period relates to the ‘post-Hendy’ delivery plan.

Project Authorisations

3.37. Network Rail continued to seek authorisations for its infrastructure projects against the Technical Standards for Interoperability. The number of infrastructure projects entered into service has increased in the final two years of the control period, driven by Network Rail’s enhancement programme.



Research and Development (R&D)

3.38. In our PR18 Final Determination, we allocated a budget of £245m + £112m of matched funding to R&D related activities for operations, maintenance, renewals and support activities in CP6.

3.39. We required Network Rail to formalise its proposed governance arrangements and apply these to the R&D programme before the start of CP6. In conjunction with this,

an advisory board was to be established to review and confirm the programme of activities before they commenced.

- 3.40. In response to our requirements, Network Rail established a new R&D Governance Board, with members covering the FNPO, its geographic routes and the SO, as well as engineering specialists. Network Rail has also established an Industry Advisory Board that reviews and confirms the programme of R&D activities before they commence.
- 3.41. Network Rail has revised its R&D governance arrangements and has set out the Rail Industry Readiness Level framework to provide an objective assessment of the status of R&D projects. Network Rail has committed to subjecting the R&D governance process to a wider review in early 2021 to assess its ongoing effectiveness. We intend to commission an independent reporter to provide this review.
- 3.42. Network Rail continues to seek third party funding and discussions are underway. Network Rail has expressed confidence that it will achieve the £112m target of matched funding over the course of CP6.
- 3.43. We have formally accepted Network Rail's proposed governance arrangements. We continue to monitor Network Rail's R&D progress through quarterly liaison meetings and are working with Network Rail to agree R&D reporting key performance indicators as well as the methodology and scope of the 2021 governance review.

4. Developing the network

CP5 enhancements delivery

- 4.1. Although the CP5 enhancements portfolio was affected by significant challenges and changes (as reported in our previous CP5 Network Rail Monitors), many projects have been successfully delivered with highlights including the examples below:
- 4.2. The Cardiff Area Signalling Renewals (CASR) scheme was completed, opening in January 2017 and allowing the operation of 16 trains per hour between Cardiff Queen Street and Cardiff Central (up from 12 trains per hour).
- 4.3. Enhancements included a new platform and southern entrance at Cardiff Central, two new platforms and a new station building at Cardiff Queen Street and some remodelling to allow for more frequent valley lines services
- 4.4. The refurbished Reading Station re-opened in July 2014. This enlarged station with a new grade separated junction has improved traffic flows and allowed better train regulation to benefit both passenger and freight services for the last five years.
- 4.5. Birmingham New Street Station – the new ‘Birmingham Gateway’ was fully completed and entered service (September 2015). Birmingham New Street is the busiest station on the network outside London and can now handle up to 300,000 passengers per day.
- 4.6. Progressive electrification continued on the Western route to enable journey time improvements on key intercity routes through the introduction of new InterCity Express trains and high seating capacity trains on suburban services. This included electrification of:
 - Stockley to Maidenhead delivered in March 2017;
 - Maidenhead – Reading – in December 2017; and
 - Reading to Didcot Parkway in December 2017 with this section used for testing new InterCity Express Trains since September 2016.
- 4.7. Further electrification on the Western Route was delivered in 2018-19, as described in the following section.
- 4.8. A 79 day closure of lines in the Derby area allowed Network Rail to deliver a £200m programme of work, including resignalling and moving control to the East Midlands Signalling Centre. At the station itself the layout was remodelled, platforms realigned and lengthened and a new platform installed. This enabled a reduction in journey

times, increased line speeds and segregation of services that previously caused conflicts and delays. The station reopened on 8 October 2018.

- 4.9. A major strategic link in the Northern Hub programme, Manchester's Ordsall Chord line opened in December 2017, linking the Manchester Airport / Manchester Piccadilly and Manchester Victoria routes.
- 4.10. The Stafford Area Improvement Programme, a series of multi-discipline schemes including new track, linespeed enhancements, resignalling and a new grade separated junction to address capacity and performance issues on the West Coast Mainline, delivered four months ahead of its regulated milestone and within budget. Network Rail's effective use of collaboration and incentivisation within a pure construction alliance was instrumental to successful delivery and has provided useful lessons to projects elsewhere seeking to engage in an alliance.
- 4.11. In total, over the whole of CP5, there were 311 milestones, with the following status:
- 168 milestones were complete (62 to GRIP3, 106 to EIS).
 - 64 milestones were missed.
 - 52 milestones were revised and a further 27 were deleted or re-planned for future control periods, through a formal change control process.
- 4.12. Additional details, including the full list of milestones in this monitor period, can be found [here](#).

2018-19 enhancements delivery

- 4.13. There have been a number of successful projects delivered in the last year of CP5. Some highlights are included in the commentary below. In addition there have been some notable failures which have required close collaboration between Network Rail and train operators to mitigate the impact on passengers and freight end users.
- 4.14. In the second half of CP5 Year 5, Network Rail had committed to deliver 44 enhancements up to key regulated milestone stages. Typically the regulated milestones are at Network Rail's GRIP3 (development up to single option selection) and Entry into Service (including authorisation) of the enhanced infrastructure. The status of the milestones was as follows:
- 27 milestones were complete (2 to GRIP3, 25 to EIS).
 - 2 milestones were missed. These were:

- Entry into Service for phase 1 of the Aberdeen to Inverness improvement project, which was delayed from March 2019 to December 2019.
- Entry into Service for weather resilience upgrades to overhead electrification in the LNE route, which was delivered late.

4.15. Ten milestones were revised and a further five were deleted, through a formal change control process.

4.16. The Western Route remained the busiest for enhancement works at the end of CP5. Six projects achieved their GRIP 6 (Entry into Service) completion milestones including:

- August 2018 Oxford phase one - Following the successful 2017 summer blockade, the summer 2018 16 day blockade successfully completed.
- December 2018 Great Western Electrification - On the mainline, Didcot to Wootton Bassett and Wootton Bassett to Bristol Parkway electrifications were successfully completed and commissioned. Reading to Newbury electrification was also finished for December 2018, allowing electric services to run on the Berks & Hants line for the first time.
- December 2018 Capacity and Capability improvements – Thames Valley capability, gauging and platform extensions were completed to coincide with the start of electric train operations between Reading and Newbury; Swindon and Cheltenham; Bath Spa and Westbury and Oxford to Worcester. A significant upgrade was also completed between Bristol Temple Meads (Dr Day's Junction) and Filton Abbey Wood, consisting of part quadrupling of the line with associated track and signalling improvements, allowing increased passenger and freight train traffic to flow along this short strategic link.

4.17. Crossrail surface works are 95% completed, new Elizabeth Line trains have been introduced and began running in service, between Hayes and Paddington high level (May 2018). Surface works still to be completed are largely station refurbishments of Western outer stations and Ilford and Romford. Delays to the central operating section reported from autumn 2018 onwards, may impact the completion of surface works, but this is, as yet, not fully defined. However, some progress has been made with Crossrail West enhanced stations expected to be complete by December 2020.

4.18. Thameslink's full fleet of 115 units have been introduced and are in service. Full infrastructure capability has been achieved through the central London core. All works at the rebuilt London Bridge station were completed and the station was handed back to business as usual teams in March 2019.

- 4.19. East West Rail (EWR) will introduce direct passenger and freight services between Oxford, Milton Keynes and Bedford by reconstructing and upgrading partially disused track. The Transport and Works Act Order public enquiry commenced on 6 February 2019 and Network Rail is working with stakeholders to address concerns and objections. The project has many interfaces including local councils, Natural England and large infrastructure programmes such as HS2. Work continues to develop the train timetable and accommodate the required services into a baseline. This project is in the development stage of the enhancements pipeline.
- 4.20. Western Rail Link to Heathrow will deliver a new rail link to Heathrow Airport from the Great Western Main Line and will allow direct travel from Reading, Twyford, Maidenhead and Slough without having to change at London Paddington. Key interfaces with other projects include the proposed third runway at Heathrow Airport, proposals for Southern rail access to Heathrow Airport and Smart Motorways for the M4 and M25. During summer 2018 Network Rail held public consultation events to raise awareness of the project and discuss proposals. Mineral extraction commenced in September 2018. Network Rail is developing the Outline Business Case (OBC) and is working closely with Heathrow Airport and DfT with the aim to submit an application for the Development Consent Order (DCO) in autumn 2019.
- 4.21. The North West electrification programme suffered notable delays with phases three (Preston to Blackpool), four (Manchester to Preston) and five (Manchester Victoria electrification, electricity bulk supply point Heyrod) all running later than originally planned.
- 4.22. In May 2018 one of the causes of the failure of the introduction of the timetable was the failure to deliver infrastructure (North West electrification phase four) for electric services⁴. The infrastructure was finally in place to allow an electric service to run in February 2019. Since then the project team was slow to complete testing required to prove that the infrastructure is safe to run services at 100mph. This was required for the May timetable change with Network Rail only confirming this would be available two days before train operators started their new services.
- 4.23. In order to enable operators to run new and longer/modified rolling stock Phase four (Manchester to Preston via Bolton) included extending approximately 128 platforms at 66 stations and gauge clearing. Platform extensions have proved more complicated and time consuming than expected even with the additional access agreed by operators. However, for the gauging works all May 2019 timetable critical work has been delivered as planned.

⁴ See May TT Inquiry Phase 1 https://orr.gov.uk/data/assets/pdf_file/0018/39042/inquiry-into-may-2018-timetable-disruption-september-2018-findings.pdf

- 4.24. For Phase five of North West Electrification Programme steel structures and wiring were completed in December 2018 and preparatory foundation works at Manchester Victoria have been delivered. The milestone for completion of this work has been delayed until June 2019. The work is required to provide resilience to the network to ensure that passengers are not disrupted if critical electricity feeds fail.
- 4.25. The original plan to electrify from Severn Tunnel to Swansea and to include the Cardiff Valleys was cut back. Electrification is expected to reach Cardiff Central in CP6, with the previous December 2018 Bristol Parkway to Cardiff electrification date being change controlled to November 2019. Parts of the Valley lines will be electrified under the Transport for Wales franchise arrangements.
- 4.26. In the Anglia route, a number of projects have faced challenges in passing crucial technical and safety assessments, which have impacted go/no-go decisions to proceed with works, and also impacted the final authorisation process to bring infrastructure into service. Recently the West Anglia Mainline project had to delay opening of the new Meridian Water station by two weeks, to resolve a number of design and construction non-conformances. Also the Felixstowe branch capacity enhancement narrowly achieved authorisation in time to start a 96 hour blockade, which would have had major impacts on freight operators and end users had re-planning been required. Similar issues occurred earlier in the control period with delays to the Gospel Oak to Barking Electrification, which we described in previous monitors.
- 4.27. The above issues were not isolated to the Anglia route and major works on the Southampton freight train lengthening scheme (Wessex route) had to be cancelled because the independent assessors identified non-conformances in key safety documentation. We are currently planning an investigation into Network Rail's capability to manage these approval processes, and we understand that Network Rail have already commissioned a number of internal investigations.
- 4.28. We have new roles and responsibilities for CP6 with regard to enhancements being carried out on the network. These have can be found here⁵.

Enhancements capability

- 4.29. An ongoing issue for us in CP5 was Network Rail's capability to plan and deliver enhancement projects and programmes. Further details of this can be found in previous Monitors.

⁵ https://orr.gov.uk/_data/assets/pdf_file/0004/40693/enhancements-in-control-period-6-roles-and-responsibilities.pdf

- 4.30. We continue to have concerns that Network Rail has not provided a robust evidence base to assure us that its capability is at the level required to deliver its obligations to its customers. Network Rail committed (in July 2018) to engage in the development of a structured framework to help provide this evidence, so we could publicly report on its capability in late 2019. The assessment framework has been developed and piloted. There were some delays to the pilot, especially due to lack of engagement with Anglia route, but Network Rail proposed mitigations to conclude this stage.
- 4.31. We plan to report using the capability framework in late 2020. This change to the original timescale is to allow the framework to provide an effective assessment of Network Rail region's capability, following the organisational changes implemented as part of its Putting Passengers First plan. Network Rail has committed to provide further information on its capability to enable us to report in the next Monitor and assure ourselves that Network Rail has the required capabilities in line with the obligations placed on it by its licence.

5. Efficiency and financial performance

- 5.1. This section examines Network Rail's efficiency and wider financial performance, including for each of the company's routes, debt and borrowing in 2018-19 and for CP5 as a whole.
- 5.2. This analysis is based on draft financial information provided by Network Rail. We will report more fully on Network Rail's financial performance in our annual efficiency and finance assessment⁶.

Expenditure on core business activities increased in 2018-19

- 5.3. We monitor the efficiency of Network Rail's core business activities. These are operations, support, maintenance and renewals. As shown in Table 1, Network Rail spent £5.9bn on these activities in 2018-19, £0.9bn (18%) more than in 2017-18.

Table 1: Network Rail's expenditure on core business activities

£m (2018-19 prices)	2018-19	2017-18	Variance	%
Operations	687	623	64	10%
Support	574	466	108	23%
Maintenance	1,545	1,457	88	6%
Renewals	3,138	2,490	648	26%
Total	5,944	5,037	907	18%

- 5.4. Network Rail has attributed the increased operations, support and maintenance costs to planned increases in work in preparation for CP6. Although these costs were significantly higher than in 2017-18, they were only slightly higher (0.3%) than budget.
- 5.5. Network Rail increased its maintenance resource in 2018-19 in preparation for its revised approach to maintenance in CP6. It also undertook additional maintenance work to rectify the adverse impact on asset condition of the prolonged hot weather in the summer of 2018. Operations costs largely increased due to commercial claims, some of which have been offset by higher 'other operating income'. Support costs increased in a number of areas including telecommunication costs and IT licences⁷.

⁶ See <https://orr.gov.uk/rail/economic-regulation/regulation-of-network-rail/monitoring-performance/efficiency-and-finance-assessment>.

⁷ Note that support costs includes some industry rates and costs in Network Rail's management accounts.

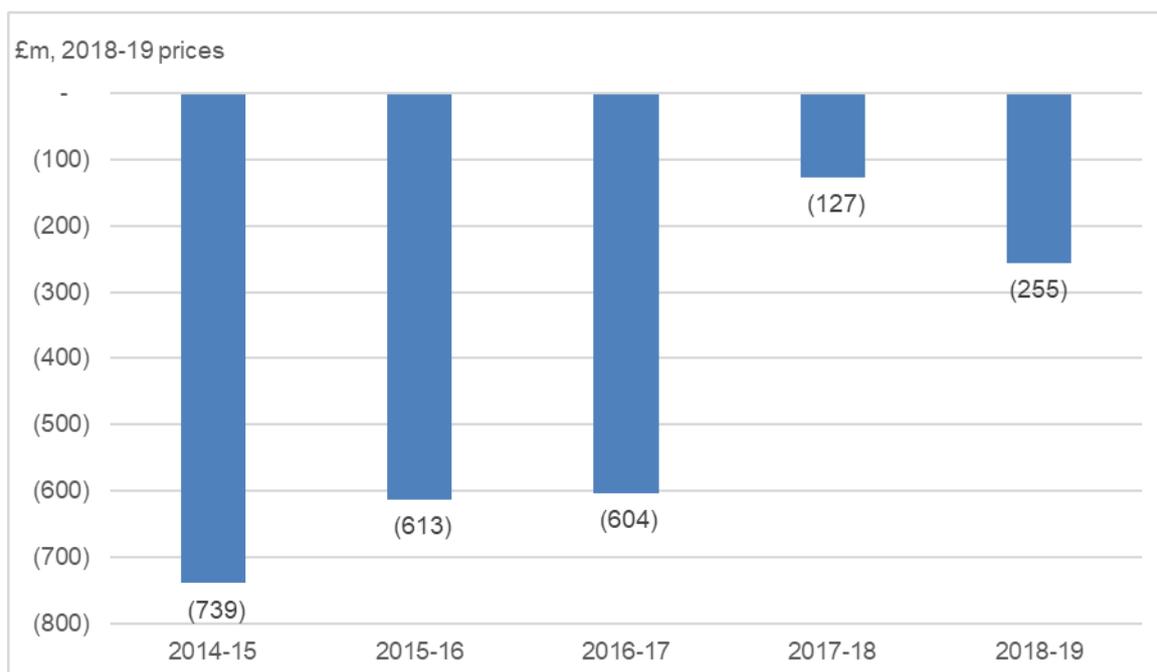
- 5.6. Renewals expenditure was 26% higher than in 2017-18 and 13% higher than budget. This was mostly due to increased volumes of work across most asset types. Network Rail sought to make full use of its available CP5 funding in 2018-19 to partly catch up on the slippage of renewals work earlier in the control period.
- 5.7. Network Rail has not yet fully demonstrated to us that this additional expenditure has been spent well. Expenditure could have increased because Network Rail has undertaken more work, or because it has spent more to undertake the same level of work as previously, or a mixture of both. We will report further on this in our annual efficiency and finance assessment.

Financial underperformance across CP5

- 5.8. The regulatory financial performance measure (FPM) provides a better understanding of Network Rail's financial performance than simple income and expenditure variances. FPM compares actual income and expenditure to Network Rail's annual budget across most items of income and expenditure, and then to the financial assumptions in our PR13 determination (which underpin the company's level of funding)⁸. It ensures that Network Rail does not benefit from delaying work to a later date if that work will still need to be done and adjusts for the value of any outputs that Network Rail was funded to, but has not delivered such as reliability of train performance.

⁸ It excludes some items of income and expenditure that are not as controllable by Network Rail. These include network grant, fixed track access charges, traction electricity income and costs, and business rates.

Figure 1: Network Rail's financial performance in CP5 compared to its internal budget



5.9. As shown in Figure 1, Network Rail financially underperformed against its internal budget in each year of CP5. The majority of this underperformance (84%) was in the first three years of CP5.

5.10. Financial performance compared to our PR13 financial assumptions was significantly worse than compared to Network Rail's internal budget. Overall, Network Rail has financially underperformed against our PR13 determination by around £10bn in CP5. This means that Network Rail spent around £10bn more than we thought that it should for the outputs that it delivered in CP5⁹. The majority of this underperformance was in renewals, enhancements and schedule 8, although Network Rail underperformed across most expenditure categories including maintenance and network operations.

5.11. Network Rail's poor financial performance in CP5 means that there is a need for significant improvement in CP6. Our 2018 periodic review set a challenging but achievable target for Network Rail to deliver £3.1bn of efficiency improvements in CP6, which Network Rail has committed to deliver.

⁹ As noted elsewhere in this Monitor, Network Rail also under delivered most of its regulatory outputs in CP5.

Table 2: Network Rail's financial performance in 2018-19

£m	Budget	Actual	Variance b/(w)	Of which out / (under) performance
Turnover	1,804	1,825	21	(4)
Schedule 4	(366)	(340)	26	38
Schedule 8	(226)	(319)	(93)	(93)
Operations	(652)	(687)	(35)	(30)
Support	(602)	(574)	28	30
Maintenance	(1,533)	(1,545)	(12)	(8)
Capex – Renewals	(2,777)	(3,138)	(361)	(9)
Capex – Enhancements	(4,338)	(3,802)	536	(180)
Financial performance against budget ¹⁰ (as shown in Figure 1)			110	(255)
Budget vs. PR13				(2,356)
Adjustments for missed regulatory outputs				(271)
Financial performance (regulatory)				(2,882)

5.12. Expenditure on enhancements was £536m lower than budget. This comprised £180m of overspend on the work that was undertaken (negative FPM) and £716m of neutral underspend¹¹. The main variances were:

- Great Western Electrification Programme (GWEP): Completion of electrification from Bristol to Cardiff has been pushed back to December 2019 with the agreement of Transport for Wales. This resulted in £171m of deferred expenditure. For the work that was undertaken, GWEP overspent by £99m. The main drivers for the overspend were access costs for a three-week blockade at Bristol Parkway and increased costs to align with the latest construction plan in Wales.

¹⁰ Neutral differences including deferral of work represent the £365m difference between the £110m of income and expenditure variances and the £255m of financial underperformance against budget.

¹¹ At a simple level, this means work planned but not done. However, the way in which FPM is calculated means that financial performance is recognised on the basis of the percentage of completion of each enhancement programme. For a project that is forecast to overspend in future years, a proportion of the forecast overspend is recognised as negative FPM in the current year. The recognition of this FPM also results in a neutral timing difference as the overspend has not yet occurred. This neutral difference is not the same as planned work in the current year not being delivered but the result of recognising FPM over the life of enhancement schemes, rather than an annual basis.

- Crossrail: Crossrail financially underperformed by £162m due to changes to contractors including the collapse of Carillion, and other factors. Crossrail enabling works experienced slippage partly offset by the reclassification of some PAYGO expenditure (see below). These do not affect FPM.
- Non-PR13 other: £183m of outperformance. Enhancements programmes are given stretching budgets with a centrally held contingency to cover expected overspends across the portfolio. This contingency is unwound at year-end. In practice, this means that performance across the individual programmes was better than reported above. However, the contingency has not been separately allocated to projects.
- PAYGO: £366m of neutral underspend on ‘pay as you go’ enhancements¹² mostly due to the reclassification of £150m of expenditure from PAYGO to Network Rail funded Crossrail works. In addition, progress on HS2 has been slower than planned resulting in less work commissioned from Network Rail in CP6.
- Ring fenced funds: £106m of neutral underspend. Network Rail was over-optimistic about the amount of investment that could be delivered through ring fenced funding.

5.13. Network Rail underperformed the regulatory financial performance measure by £2.9bn in 2018-19 largely because its internal budget was £2.4bn higher than our PR13 financial assumptions for the year. It underperformed against its own budget by £0.3bn and the regulatory measure includes a further £0.3bn downward adjustment for train performance being lower than the regulatory target¹³.

Route level financial performance in 2018-19

5.14. Network Rail’s routes are the geographic sub-divisions that have devolved responsibility for managing the rail network. The following table summarises routes’ financial performance in 2018-19 compared to budget.

¹² PAYGO enhancements are schemes that are directly funded by third parties, rather than by Network Rail.

¹³ The regulatory financial performance measure includes downward adjustments for under-delivery of train performance and other regulatory outputs.

Table 3: Routes' financial performance in 2018-19 compared to budget

£m	Financial performance b/(w)	Percentage of budget
Anglia	(24)	-3%
LNE & East Midlands	(26)	1%
LNW	(111)	-5%
South East	3	0%
Western	(117)	-7%
Wessex	(44)	-7%
England	(319)	
Scotland	23	2%
Wales	(13)	-2%
Central services ¹⁴	54	
Great Britain	(255)	

5.15. Two routes (Scotland and South East) outperformed against budget in 2018-19 (by £23m and £3m respectively). Our [Network Rail Scotland Monitor](#) provides details about Network Rail Scotland's financial performance. South East's outperformance was mostly due to lower than budgeted Schedule 4 payments, partly offset by underperformance on renewals.

5.16. Six routes underperformed against their budgets in 2018-19. Western and LNW had the largest underperformance (£117m and £111m respectively). LNW's underperformance was largely due to overspend on enhancements and Schedule 8 costs. Western's underperformance was largely due to overspend on the GWEP.

Debt and borrowing

5.17. Network Rail's debt increased from £32.3bn to £53.4bn across CP5 including a £3.0bn increase in 2018-19.

5.18. Following its reclassification to the public sector during CP5, Network Rail agreed to borrow from the UK Government rather than through the issuance of debt. As part of this, Network Rail agreed fixed borrowing limits with the DfT for its activities in England and Wales, and in Scotland for CP5¹⁵.

5.19. In previous monitors, we have expressed our concern with Network Rail's processes for managing its cash position. As CP5 has now finished, this risk did not materialise.

¹⁴ Network Rail's internal budget analysis does not allocate the cost of central services to routes. Our analysis in the Scotland Monitor and the Wales section of this Monitor includes their portions of the costs of these activities. So those numbers are different to the ones above.

¹⁵ There were separate limits for England and Wales, and for Scotland.

We note that Network Rail made full use of its available cash limit in CP5 without exceeding it and that it has formed a cash management group to oversee business performance and target improvements. Network Rail considers that its business forecasting has improved through clarifying accountabilities, benchmarking and best practice sharing. Routes developed overplan provisions in 2018-19 to mitigate risk of slippage to their renewals programmes and develop options for the acceleration of CP6 works. These were brought into use as headroom became available.

5.20. In CP6, Network Rail will no longer borrow other than to refinance existing debt, and it will be subject to more restrictive government budgetary processes¹⁶. Maintaining this focus on cash management will be important given the limits on Network Rail's ability to move funding between years.

Asset disposals

5.21. Network Rail disposed of a significant part of its commercial property estate in 2018-19, raising £1.5bn of revenue from the sale¹⁷. The disposal comprised around 5,200 properties in England and Wales. The majority of properties are converted railway arches and are not used in the operation of the railway. Network Rail also disposed of some freight, logistics and other sites for around £0.1bn. These disposals were consistent with the company's network licence obligations¹⁸.

Getting ready for CP6

5.22. Because poor planning for CP5 caused a number of the problems with Network Rail's renewals delivery and efficiency, we required Network Rail to show that it was better prepared to deliver efficiently from the start of CP6.

Renewals planning

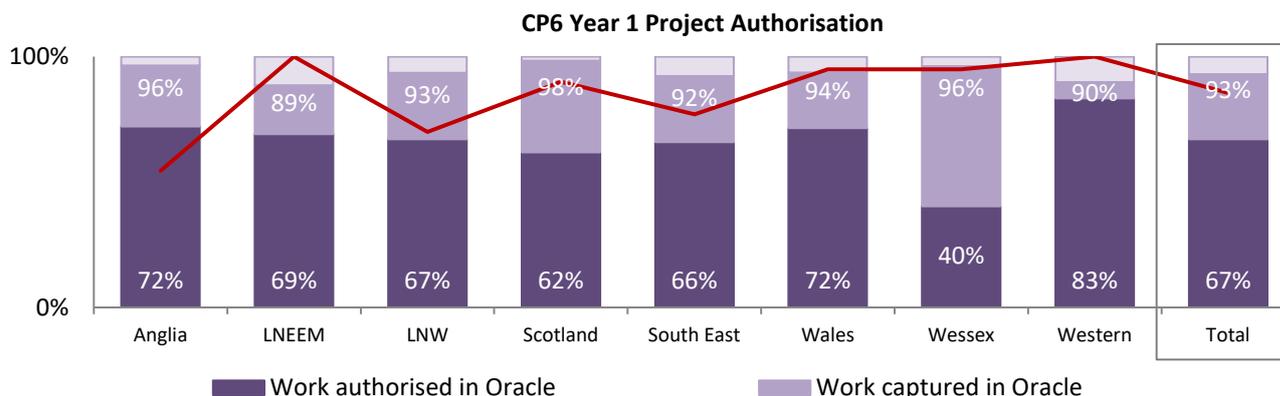
5.23. Effective renewals planning is important because it improves the robustness of the network and reduces costs. It provides a stable profile of work for Network Rail's supply chain, can avoid more critical work than necessary being planned for delivery in the final quarter of the year (when weather conditions are most challenging) or prevent slippage of work into the following year.

¹⁶ These are explained in our 2018 periodic review, see https://orr.gov.uk/data/assets/pdf_file/0004/39307/pr18-final-determination-financial-framework.pdf.

¹⁷ See <https://property.networkrail.co.uk/commercial-estate-sale/> for further details.

¹⁸ The network licence includes conditions relating to land disposals. See <https://orr.gov.uk/rail/economic-regulation/regulation-of-network-rail/network-licence>.

Figure 2: Percentage of renewals projects in 2019-20 with financial authorisation



5.24. Nationally, 67% of renewals projects for 2019-20 (by value) had completed detailed designs and received financial authorisation for delivery. This was 19 percentage points behind Network Rail’s internal 86% target¹⁹.

5.25. Given that around a third of forecast renewals had not yet received financial authorisation at the start of the year, Network Rail still had substantial work to do to finalise its renewals workbanks for 2019-20, even though the year had already commenced.

5.26. Wessex route had the lowest score with 40% of work authorised. It subsequently authorised a large signalling renewal in period 1 of 2019-20, increasing work authorised to 61%. However, this was still significantly lower than the route’s target.

5.27. We recognise that financial authorisation in Oracle represents a late stage in the renewals planning process and that we would not necessarily expect all planned work to have received financial authorisation by the start of the year. Network Rail also considers that whilst most routes are behind their own targets, these levels are an improvement on previous years.

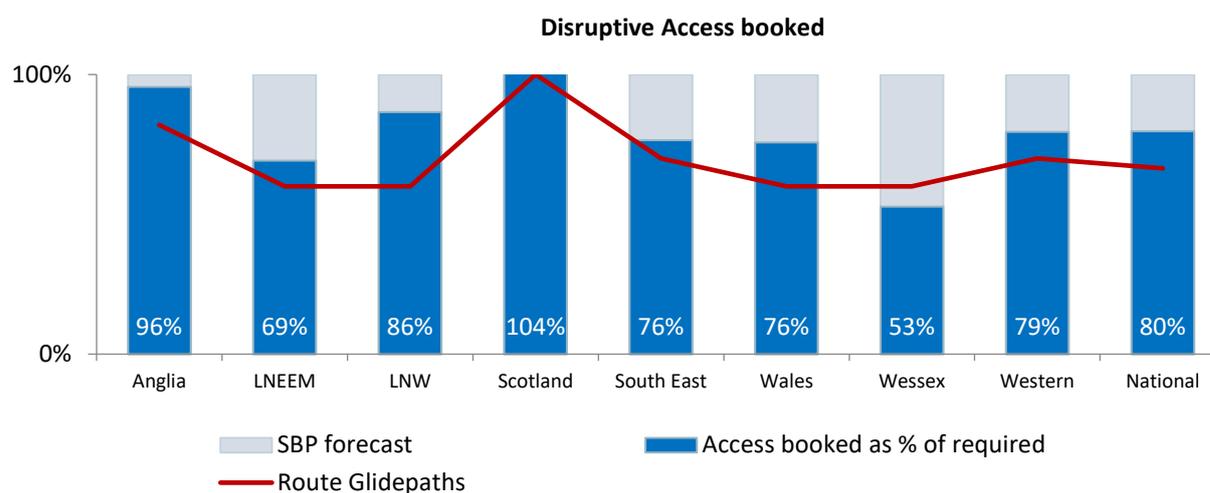
5.28. We recently commissioned the independent reporter, Nichols, to review Network Rail workbank preparations. Nichols’ work is still underway. Its early findings are that workbanks are well developed for 2019-20 and that reasonable progress has been made for 2020-21. However, the leading indicator only provides a partial picture. It is coarse and masks differences between asset classes. Nichols has identified additional sources of information, which Network Rail is currently considering to improve its insights into workbank planning. We will report further on this in our next monitor.

¹⁹ Network Rail’s internal target is largely based on routes’ performance over the past two years.

Securing engineering access to the railway

5.29. Most routes appear to be on track for booking disruptive access to the network for planned engineering work in 2019-20. Nationally, 79% of forecast disruptive possessions in 2019-20 have been booked in Network Rail's possession planning system, compared to Network Rail's 66% internal target at the end of 2018-19.

Figure 3: Percentage of required network access in 2019-20 booked



Maintenance capacity

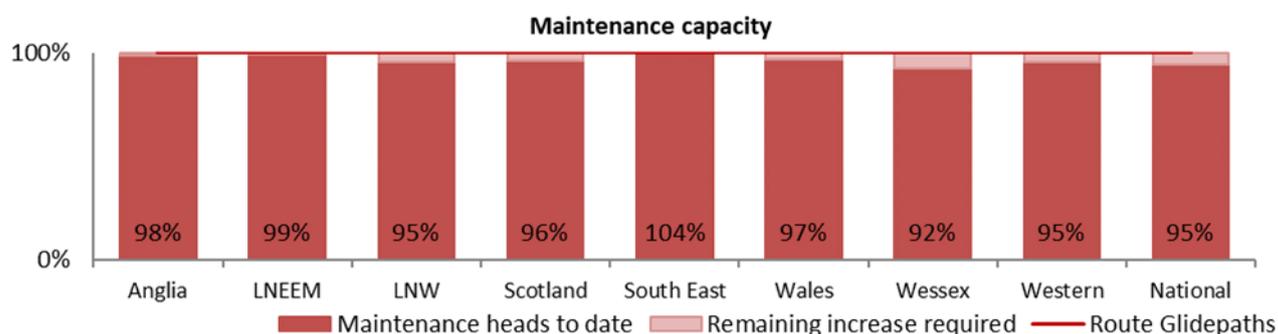
5.30. At the start of 2018-19, Network Rail intended to recruit around 490 additional full time employees during the year to ensure that its routes have adequate capacity to deliver planned increases in maintenance activities in CP6. At the time that we reported in our November monitor, the planned increase in maintenance headcount had gone up to 630 full time employees, of which it had recruited around 10%. At the end of 2018-19, the planned increase was 680 full time employees, of which it had recruited only 58%.

5.31. Network Rail is satisfied that the changes that it made to its planned maintenance resource in 2018-19 reflected a better understanding of its routes' requirements, in particular, in LNW, Western and Scotland. Network Rail is content that the shortfall in recruitment is not significant compared to the scale of its total maintenance headcount and that the maintenance volumes can be managed through the use of overtime and contractors.

5.32. Overtime and contractors can be useful to manage short-term peaks and troughs in maintenance work. However, the changes within the year to Network Rail's planned increase to maintenance headcount have made it difficult for us to assess the effectiveness of this recruitment, particularly as there have also been errors in Network Rail's reporting. However, Network Rail did not achieve its planned increase

to maintenance headcount in 2018-19. Given that the increase relates to planned long-term increases to maintenance activities throughout CP6, this is not just an issue of routes managing short term resource gaps, but of long term resource planning. As a result, we consider that there is a risk that Network Rail may now need to make greater use of overtime and contractors for a longer period to deliver the required volumes. This risks increasing costs and decreasing efficiency. Network Rail recognises need for routes to manage this risk within their funding levels.

Figure 4: Network Rail’s assessment of the maturity of its 2019-20 efficiency plans



Efficiency planning

5.33. We recently reviewed Network Rail’s progress in planning how it will deliver efficiency improvements in CP6. Our detailed findings were published in March 2019²⁰.

Overall, we considered that Network Rail is better prepared to deliver efficiency improvements in CP6 than it was at the start of CP5. However, we identified areas where improvements should be made to efficiency plans and Network Rail’s related processes for monitoring their delivery.

5.34. As a result of our review, Network Rail developed an action plan to improve planning and monitoring of the delivery of efficiencies in CP6. We are reviewing Network Rail’s progress in implementing the action plan. One of the key changes that Network Rail has already implemented is to replace the CP6 efficiency trackers that it used in the run up to CP6 with a more extensive maturity assessment of routes’ plans for 2019-20.

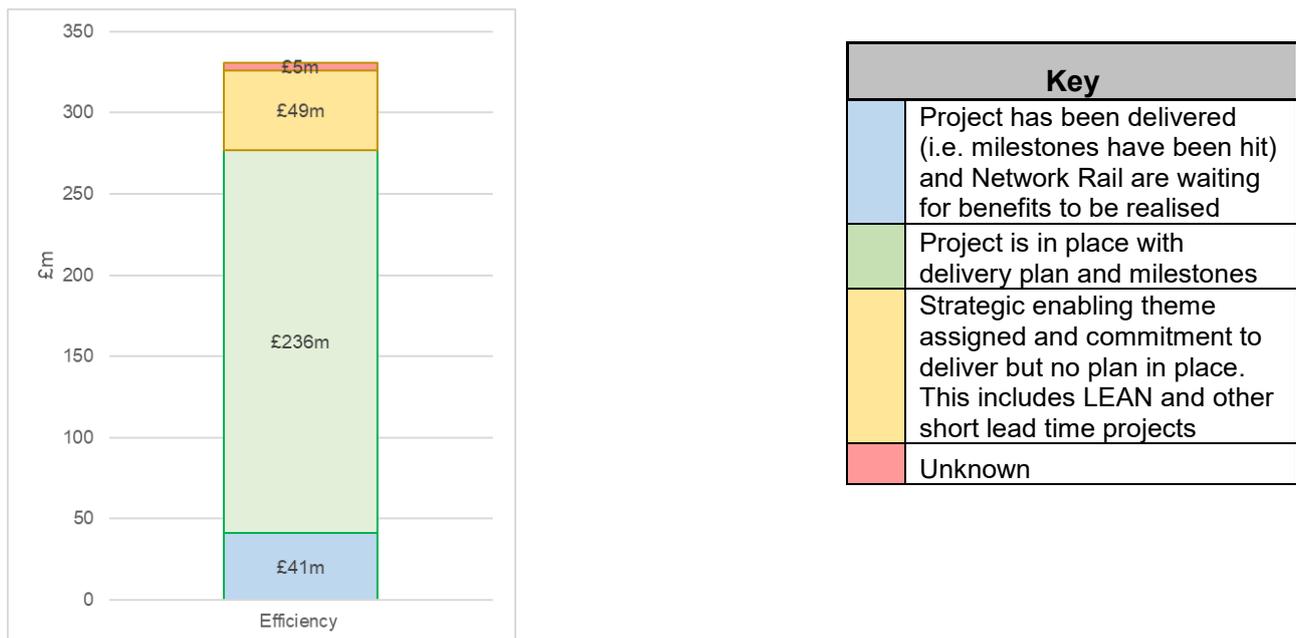
5.35. Network Rail is developing new efficiency reporting tools that routes are required to produce on a periodic basis. Network Rail is also developing calculators for routes to report efficiencies on a consistent basis. We are currently reviewing the efficiency calculators and the processes for their approval.

²⁰ See https://orr.gov.uk/data/assets/pdf_file/0020/40844/network-rails-preparedness-to-deliver-efficiency-in-control-period-6-2019-03-28.pdf.

5.36. Network Rail is aiming to deliver £330m of efficiency improvements in 2019-20, which is slightly ahead of the £320m in our PR18 determination. As shown in Figure 4, Network Rail has a high confidence that £41m of efficiencies will be achieved from business changes that have already been made. £236m of efficiencies have a delivery plan. £49m has been committed through small, short term improvement actions which do not have a clear action plan. £5m is classified as unknown.

5.37. We recently commissioned the independent reporter, Nichols, to review Network Rail’s efficiency plans for year 1 and 2 of CP6. Nichols work is still underway. Its early findings are that there is clear ownership within routes of the business changes that are required to deliver required efficiency improvements. However, there is variable quality of documentation of how forecast efficiencies have been calculated, and how efficiencies will be delivered. We will report further on this in our next monitor.

Figure 5: Network Rail’s assessment of the maturity of its 2019-20 efficiency plans



Changes to our monitoring approach for CP6

5.38. As part of PR18, we consulted on changes that we intend to make to the way that we assess Network Rail’s efficiency and financial performance²¹. In CP6, we will provide

²¹ See <http://orr.gov.uk/rail/economic-regulation/regulation-of-network-rail/price-controls/periodic-review-2018/pr18-consultations/our-approach-for-assessing-network-rails-efficiency-and-wider-financial-performance-in-control-period-6>.

more rounded assessments that draw out key messages about the drivers of performance, recognising that different audiences want different levels of technical detail. We will also make more informed forward-looking assessments of the efficiencies that Network Rail will likely deliver across the control period.

5.39. To support these changes, Network Rail will need to make changes to the information that it provides to us. Network Rail has largely supported our intended changes and is working with us to agree how these should work in practice. Network Rail has committed to:

- improve its communication of the reasons for cost changes due to changes to routes' efficiencies, mix of work and external factors;
- provide a sharper focus on performance compared to delivery plans; and
- identify the most appropriate measures of routes' productivity and leading indicators of performance.

5.40. Our finalised approach will be set out in our CP6 regulatory accounting guidelines.

6. Glossary

Term	Explanation
Cancellations and Significant Lateness (CaSL)	The proportion of trains which arrive at final destination greater than 30 minutes from planned arrival, or full/part cancelled or missed calls
CAPEX	Refers to the funds used by Network Rail to acquire or upgrade physical assets on the railway and related infrastructure in order to maintain or increase the scope of their operations. Such expenditure is referred to as Renewals (of existing infrastructure e.g. works that will provide long term benefits such as replacing a section of track) or Enhancements (upgrading existing or building new infrastructure, e.g. electrification of a railway line).
Civils	A term describing only those responsible for structures such as bridges
Composite Reliability Index (CRI)	It provides an indication of the contribution of asset reliability to the safety and performance of the railway.
Control Period	<p>A control period is the period to which an access charges review (e.g. a periodic review) applies. Control periods are typically five years in length, but maybe shorter or longer depending on what the regulator decides as part of the review.</p> <ul style="list-style-type: none"> • CP6 covers from 1 April 2019 to 31 March 2024 • CP5 covers from 1 April 2014 to 31 March 2019 • CP4 covers from 1 April 2009 to 31 March 2014 • CP3: 1 April 2004 to 31 March 2009 • CP2: 1 April 2001 to 31 March 2004 • CP1: from the privatisation of Railtrack to 31 March 2001
CSAMS	Civils Strategic Asset Management Solution
DfT	Department for Transport
Earthworks	Natural earth slopes and earth-related structures such as cuttings and embankments
ECAM	Enhancements cost adjustment mechanism
EDP	Enhancements Delivery Plan
EIS	Entry into service
Ellipse	Computer based asset management system used by Network Rail to record and prioritise the maintenance work required to be done and when.

Term	Explanation
Enhancements	Schemes to change to network outputs, usually involving construction, that improves network capacity or capability (e.g. enabling higher speeds, allowing heavier loads) relative to the level of network outputs funded at the last relevant periodic review. Usually outputs are required at specific times (in contrast to most renewals).
Fatalities and Weighted Injuries (FWI)	An index measuring relative risk from fatalities, major and minor injuries.
Final Determination	Our final determination sets out our overall package of decisions for the periodic review 2013 (PR13).
Fixed Track Access Charges	The fixed track access charge (FTAC) recovers Network Rail's net revenue requirement. The net revenue requirement is the revenue that we determined in a periodic review is required by Network Rail to run its business, after accounting for the income received from short-run variable track access charges, regulated station charges, other single till income and the network grant. The FTAC is only paid by franchised passenger train operators.
FPM	Financial Performance Measure
Freight Delivery Metric (FDM)	This measure tracks the punctuality of freight services at destination as well as taking into account Network Rail caused delays.
Gauge	Distance between the inner running faces of two rails on the same track. Also used to describe the "envelope" through which train profiles must fit; this is the structure gauge.
GRIP	Governance for railway investment projects. A Network Rail formal procedure through which investment project on Network Rail's network must pass. It consists of a number of stages; at the end of these a review is carried out and if the project cannot meet the pass criteria it is stopped or held until it does.
GWEP	Great Western Electrification Programme
HAVS	Hand Arm Vibration Syndrome
High Output Track renewal	A system for renewing track in part or as a whole far more quickly than has been possible in the past.
Independent Reporter	A consultant whose role is to provide ORR with independent, professional opinions and advice relating to Network Rail's (as the railway licence holder) provision or contemplated provision of railway services, with a view to ORR relying on those opinions or advice in the discharge by ORR of its functions.
Infrastructure Projects	Network Rail division in charge of overseeing the company's CP5 enhancements programme.

Term	Explanation
Linespeed	The maximum safe speed for a train to travel on any section of railway line taking into account infrastructure limitations.
LNE/EM Route	London North Eastern / East Midlands Route
LNW Route	London North Western Route
LTIFR	Lost Time Injury Frequency Rate - a measure of the number of lost time injuries occurring in a workplace per 1 million man-hours worked.
Moving Annual Average (MAA)	Moving annual average - the average of the last 13 four-week time periods.
Network Grant	A proportion of Network Rail's income in the past has been paid directly by DfT and Transport Scotland in the form of network grants. Over CP5, more than 60% of Network Rail's income is forecast to come from network grants.
Network Licence	Network Rail operates under a network licence. This licence contains a set of conditions under which Network Rail must operate. As the operator and owner of the national rail infrastructure, it has a key role to play in railway safety and improving railway performance and efficiency. The network licence is a tool we have for holding Network Rail to account.
Network Rail managed stations	Managed stations are the stations at which Network Rail is the station facility owner. There are currently 18 managed stations, these are all large stations. A list of the managed stations is available on the Network Rail website.
ONS	Office of National Statistics
Operational Property	Buildings, land and structures in use as part of the operational railway.
OPEX	Operating expense: as distinct from CAPEX (capital expenditure), OPEX refers to ongoing costs incurred by Network Rail to maintain the railway infrastructure. Examples of OPEX include routine safety checks on the railway tracks or repairing signalling when it fails.
ORBIS	Offering Rail Better Information Services. A Network Rail initiative, its aim is to make information available in all forms including a mobile access and a local view to avoid site visits.
Overhead Line Equipment (OLE)	An assembly of metal conductor wires, insulating devices and support structures used to bring traction supply current to suitably equipped traction units. The conducting wires are normally strung

Term	Explanation
	between masts or poles in some form of catenary arrangement but simple systems may have a single trolley wire.
Performance Strategy	Jointly prepared plans agreed between Network Rail and a train operator to improve performance.
Plain Line Track	Track without switches and crossings
Planning and Delivering Safe Work (PDSW)	PDSW is a wholesale reform of how infrastructure projects are planned and delivered safely and, ultimately, it makes clear who is responsible.
Possession Disruption Index (PDI)	<p>'Possession disruption index – passenger' (PDI-P) and 'Possession disruption index – freight (PDI-F)': a graph indicating the level of disruption caused by possessions over a period of time.</p> <p>Network Rail needs to restrict access to the network to carry out many of its maintenance and renewals activities.</p> <p>These restrictions of access are referred to as possessions. Possessions are considered to be 'disruptive' if they impact on the running of passenger or freight operators' normal timetabled services.</p>
Possessions	Network Rail needs to restrict access to its network to carry out many of its maintenance and renewals activities. These restrictions of access are referred to as possessions.
Precursor Indicator Model (PIM)	A model which measures the underlying accident risk by tracking changes in accident precursors.
Public Performance Measure (PPM)	The Public Performance Measure (PPM) is the percentage of trains arriving at their final destination within 5 minutes of their scheduled arrival time (within 10 minutes for long distance services).
Regulated Outputs	These are outputs that we determine as part of our periodic review that Network Rail is required to deliver over the relevant control period.
Renewals	Major capital works or replacement of the network in order to maintain its required capability. These may be required at specific times but are more often carried out according to Network Rail's own timetable
Right Time	Performance measure measuring train arrival within one minute of the scheduled time
RM3	Rail Management Maturity Model: the tool we use to assess an organisation's ability to achieve excellence in controlling health and safety risks.
Route availability	A code used to indicate which rolling stock can use which routes.

Term	Explanation
Safety Management System (SMS)	In essence, it is a formal arrangement for a safer working environment. All operators and duty holders are now required to have arrangements in place for managing safety risks. A safety management system defines roles and responsibilities, sets arrangements for safety mechanisms, involves workers in the process and ensures continuous improvement.
Schedule 4	Schedule 4 (the possessions regime) is the part of passenger and freight operators' track access contract with Network Rail that sets out arrangements for compensation to the operator in the event of planned disruption to their services.
Schedule 8	Schedule 8 (the performance regime) is the part of passenger, freight and charter operators' track access contract with Network Rail that sets out arrangements for compensation in the event of unplanned disruption to services.
Scour	The removal of material from a bed or bank of a watercourse or material from a beach by current or wave action. This is a particular problem where the removed material was providing support or restraint to a structure such as a bridge pier or retaining wall, ultimately leading to its collapse.
Switches and Crossings (S&C)	Track consisting of switches (an assembly of two movable rails – the switch rails) and two fixed rails (the stock rails) and crossings (an assembly that permits the passage of wheel flanges across other rails where tracks intersect).
Temporary Non Compliance (TNC)	An approved time-bound derogation from a requirement in a company standard.
TOC	Train operating companies: run the passenger trains and services on the network.
Track Geometry	The horizontal and vertical alignment of the track.
Train Accident Precursors Indicator Model (PIM)	RSSB's Precursor Indicator Model (PIM) provides a measure of the underlying risk from train accidents by tracking changes in the occurrence of accident precursors
Train Regulation	The management of the passage of trains on a route using junctions and loops so that slower trains do not impede faster ones.
Underbridge	Bridges that allow passage under the railway.
User- worked crossings	A level crossing where the barriers or gates are operated by the user.
Wrong-side failure	A failure that causes a piece of equipment to cease functioning in such a way as to cause danger to the safety of the line.



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