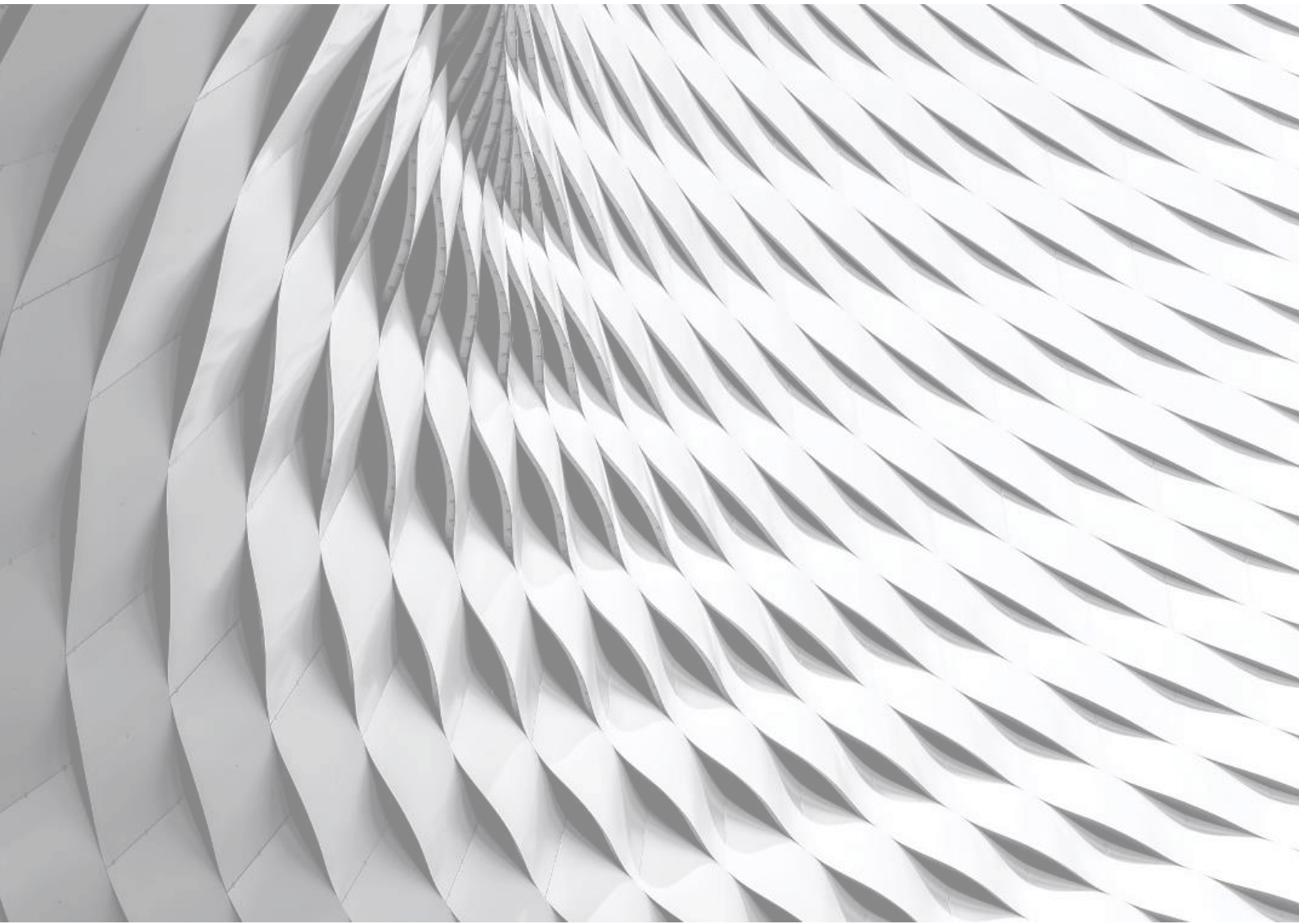
Possessions Efficiency Review

Independent Report

Office of Rail and Road / Network Rail

16 April 2021

→ **The Power of Commitment**



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Executive Summary

Efficiency of Applying Network Rail's Possessions Process

KR 1: How the Regions determine the level of access

In broad terms, the level of access needed for possessions by Routes is driven by the network context and asset characteristics in that location and the type of work needed, leading to the type of engineering access and the protection required. Track usage adds to the variable needs for the access window that can vary significantly across the Regions.

The current lockdown of changes at seven weeks or closer to delivery appears to be ineffective. We can deduce this judging by the volume of changes that still occur during that time. Late changes should be considering the alternatives. In some cases, not allowing a late change may itself carry business or safety risks - for example, where it leaves a defect unaddressed for several weeks. Access is determined through a series of consultations across the EAS timeline and a shoehorn of work into the timetables white space. We conclude that this comes with efficiency implications and cost.

Capacity and the drive to squeeze the timetable is a key restraint in Regional teams' determination of the level of access needed. This is not reflected as shorter possession durations, but a shift away from Section 4 possessions altogether. Factors that are affecting efficiency with regards to determining access include:

- Available white space after capacity has been determined
- The cost of disruption
- Lockdowns and changes to the CPPP.

Recommendations

Late change review

We conclude that there is a high volume of changes to access plans, including cancellations as well as extended, curtailed, and new possessions. The timing of these changes ensures that the plans associated with them have only the minimum discount under the Schedule 4 mechanism. This increases compensation costs for Network Rail in the event of disruption. The EAS lockdown of changes at seven weeks or closer to delivery appears to be ineffective - the peak of changes occurred at T-7 despite changes at this time only being permissible where they are business or safety critical.

We recommend that Network Rail conduct an in-depth analysis of what root-causes facilitate late changes and whether those changes are good or bad with respect to efficiency and stakeholder requirements / whole industry value. Actions include:

- Late change survey to conduct an in-depth analysis of what causes late changes
- Consolidation of governance under one national programme such as the APP
- PPS updated to enable categorisation of changes based on this review. Changes should include variations to start or finish time of possession, cancellation of possessions or late creation of possessions.

We also recommend a survey of current manual processing activities to understand the extent of the manual processing of data and information in Network Rail. The survey should identify the amount of time spent by individuals:

- Manipulating spreadsheets
- Performing day-to-day tasks that are regularly repeated
- Looking for information or data
- Dealing with errors, repeating work, performing work that has been performed by someone else.

This would provide senior management with a better idea of the waste, inefficiency and risk that this issue poses to the business and would provide evidence to back up any business cases to automate these tasks where possible.

Recommendation P1 Conduct in-depth survey and analysis of (i) the causes of late changes and their impact on possessions efficiency; and (ii) the manual approaches to processing possessions data and information. Root-cause understanding of these two areas could significantly improve efficiency.

Ease	Impact	Owner
Medium	Medium	Access Planning Programme, Intelligent Infrastructure

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KR 3: Efficiency of Regions at planning and delivering possessions work

Access and possession planning

We conclude that integrated planning plays a critical role in facilitated coordination so that stakeholders and plans are aligned, helping to minimise rework. All Regions and Routes consulted have set up, are in the process of setting up, or have plans to set up integrated planning teams. These teams focus solely on improving the efficiency of access planning in the following areas:

- Reducing operator challenges to the EAS
- Reducing Schedule 4 costs and therefore disruption to the passenger by optimising the amount of work delivered in a possession
- Improving on time performance of heavy resources in possessions.

The teams place large emphasis on coordination between the many stakeholders involved. This included operators, asset management teams and works deliverers across large renewals and enhancements projects which require large volumes of disruptive access. Integrated planning plays a critical role in facilitated coordination so that stakeholders and plans are aligned. There is a need to further consolidate this type of culture with respect to late changes.

What is clear is that there is a separation between development planning and delivery planning, with a missed opportunity to rework medium - notice plans in the interceding weeks. This can be correlated with the low usage of the medium notification discount in the Schedule 4.

Possession delivery

We note that the signaller's attention is a clear constraint in the handover and hand back process with possessions.

The Network Rail Online Logistics (NROL) database records the planned and actual arrival times of OTMs (on-track machines) and possession trains booked to attend possessions. The late arrival of these resources can have a large impact on the ability of the possession to carry out on schedule. Delays of over 20 minutes occurred in 8.2% of trains planned to attend possessions (E-C-0353).

The need to exploit worksite productivity is clear. Most Routes see peaks where most worksite links are created, at T-37, T-12 and T-6 respectively. This is where the maximum notification discount deadline for PPS, the Informed Traveller deadline (as well as some regional planning deadlines) and near the late change lockdown deadline of T-7 occur. This indicates a separation between development planning and delivery planning, with a missed opportunity and rework for "medium" notice plans in the interceding weeks.

Recommendations

Integrated planning

We recommend that a team is mobilised and dedicated to integrated, long-term possession planning in each Route. These teams must extend to the Engineering and Asset Management team to ensure integrated planning at the work bank specification stage of the planning process.

Best practice integration of access and work plans should be identified across the processes already in place by the various Routes. These processes should be enhanced by clear line-of-sight, training for access planners, and planning tools to enable effective and efficient access plans to be built. The creation of these regionally based planning teams will allow for devolved decision-making taking place close to the impacted areas. However, it must be balanced with the existence of a central 'guiding mind' for controlling nationally limited resources and for sharing lessons learned from regional teams to equivalents in other areas.

Recommendation P2 Establish a dedicated long-term integrated possession planning team in each Route to promote devolved decision-making close to the impacted area and improve access planning and delivery efficiency.

Ease	Impact	Owner
Medium	Medium	Access Planning Programme

KR 4: How Regions balance efficiency and contingency when planning and using possession

We acknowledge that a review is already planned with regards to the Delivering Work Within a Possession (DWWP). Clear understanding of the protocols related to what work can be delivered in contingency/float time is needed. This will ensure possession time is fully utilised and first and last trains of the timetable are not compromised. We also found that the data related time and usage of the contingency float is limited, inconsistent and not nationally analysed (E-C-0266), (E-C-0407). Balance therefore is not evident.

Recommendations

Use of contingency reasoning

We recommend a full DWWP review takes place to better integrate the guidelines surrounding the use of contingency time into the wider system architecture. Actions include:

- Assess the communication and guidelines surrounding the use of contingency time to ensure clearer understanding throughout Network Rail. This will enable better use of contingency time to deliver work in possessions and drive improvements in efficiency. Further, gather and analyse data surrounding the use of contingency time to ensure contingency levels are appropriate. This should integrate protocol accountabilities with PICOPs and signallers.
- Given the lack of easily accessible data surrounding contingency time (noting that ODM reports do contain this information but that it is of low consistency), add data to the "Time Recording" workstream of the Intelligent Infrastructure Planning programme.

The outcome should be to achieve a demonstrably consistent NR-wide understanding of the meaning of the contingency time guidelines and to establish effective monitoring of contingency time utilisation across the business. This is an internal NR exercise consisting of a communication and training programme, with a monitoring process stewarded centrally.

Recommendation P3 Undertake a full DWWP review to better integrate the guidelines surrounding the use of contingency time into wider systems. This should establish use of contingency within possession and integrate protocol with PICOPs and signallers.

Ease	Impact	Owner
Medium	Medium	Access Planning Programme

Possession's performance metrics

At a national level and through engagement with the Routes, clear measures should be defined against the elements of the planning and delivery process that are identified as the largest drivers of inefficiency. The sources of data that inform these measures should be identified and efficient, centralised, data processing workflows be implemented to enable easy access of data by the Route to monitor the measures and drive improvements.

We recommend that key efficiency measures for possession planning delivery efficiency are defined and implemented. There are a number of measures that would greatly enhance Network Rail's understanding of efficiency and its ability to drive improvements. A definitive set of measures should be developed and integrated into the System Operator scorecard structures. Actions include:

- Agreement with the ORR that link into other regulatory measures
- The Regions and Routes should then design and build their own performance monitoring dashboards to ensure they have control and can design the dashboard to meet the specific requirements of the Route
- The outcome should be to achieve a detailed understanding of the drivers of inefficiency in the possession planning process and to put in place the ability to explicitly measure them to ensure the business is able to drive improvements.

Recommendation P4 Implement a definitive set of KPI measures that integrate the System Operator scorecard structure tiers 1 -3 that focus on possession productivity and efficiency.

Ease	Impact	Owner
Easy	High	System Operator

KR 5: How Network Rail uses and records information relating to possessions to inform decision making

Possession Planning System (PPS) PPS is the core system behind information that supports possession planning and coordination. It contains a full record of all possessions that have been undertaken or that are planned. We note that through the efforts of this review, no prior data analysis has previously taken place on the systems metadata (E-C-0431).

There is widespread resistance to changes to the Possession Planning System (PPS) despite it not having the ability to capture information in a format conducive to optimising the wider planning process (E-C-0314). The lack of a unifying location referencing system means it is not practicable to analyse Ellipse work bank data with respects to possessions. This type of analysis could potentially yield significant insight into the detailed access requirements to deliver the planned maintenance regimes and reactive works. This lack of a unifying data architecture also means that key systems are unable to communicate with each other which limits cross-functional analysis. Routes go to great efforts to gather information that supports decision making across the four major themes cited above. Overrun's data is well managed and accessible in the POC database. Possession change data is in PPS which is relatively accessible. Time in possessions data and lost work in possessions data must be captured during the possessions and is often captured in spreadsheets and PDFs, making it difficult to process and therefore monitor in a meaningful way.

While manual processes cannot be eliminated, the large volume of manual work required at many steps of the EAS and worksite delivery is an immense source of inefficiency.

There is also no common and definitive set of Key Performance Indices (KPIs) related to possessions efficiency that are reported by the SO in terms of scorecards. Efficiency of possessions also has no formal definition.

There is significant variation in the ways that the routes monitor specific possessions information that drives decision making.

Recommendations

Digitalisation of information workflows

Studies have shown that up to 25% of resource time can be spent in search of information in organisations with substandard information management[1] and that organisations with a data driven analytics culture financially outperform their competitors[2] and achieve their business goals[3]. Whilst a data management and monitoring maturity score is not a definitive measure of Route performance, it is a useful indicator. The maturity of the Routes' monitoring of specific process measures, with respect to information, data management and communication, is key factor in determining how they use and record information to inform decisions.

We conclude that there is a significant opportunity to digitalise possessions information currently being disseminated throughout Network Rail to significantly improve the efficiency of the access planning process. This includes the EAS, an Open Source digital diary, Rules of the Resource and lessons learned. Actions include:

- All non-mandatory access planning rules and guidelines be captured digitally. This could include:
  - A digital diary that all stakeholders, including Network Rail, operators, supply chain, other transport agencies and local authorities can access to optimise the access windows
  - Digitalised lessons learnt or ways of working that enable easy reference during access determination

[1] Note: "The Real Cost of Asset Information: How Better Costs Less", Ruth Wallsgrove, Sarras, '03
[2] Retrieved from: Data-driven companies outperform peers financially, reveals Tableau-sponsored Economist Intelligence Unit survey
[3] Retrieved from: Insight-driven organization | Deloitte Insights

- Consolidation of governance under one national programme such as the APP
- The EAS is captured, edited and communicated digitally, and that all access planning rules and guidelines be captured and communicated digitally
- All Routes engage with their operators to supply Rules of the Resource documents that dictate when operators do not want access to be disrupted. This would significantly improve communications between Routes and operators and enable more effective and efficient planning of access.

The outcome should be to increase the speed and reliability of the EAS negotiation process and ensure that all access planners have the same information available to them to carry out their roles.

Recommendation P5 Digitise the EAS tools of the possession planning process and formalise changes of the EAS.

Ease	Impact	Owner
Easy	Low	Access Planning Programme

PPS and NROL data accessibility

There are also multiple avenues for further data exploration exist for expanding upon the work presented here. These can be split broadly into analysis on existing data accessibility, and analysis of characterisation.

We recommend that accessibility to data in Possession Planning System (PPS) and Network Rail Online Logistics (NROL) is significantly improved to enable efficient day-to-day operations and consistent and efficient performance monitoring. These can be split broadly into analysis possible on the existing and already accessible data sources and analysis which could easily become available given an effort to bring together currently disparate data sources. Actions include:

- Characterise a centralised “data lake” that is accessible by Business Intelligence (BI) tools such as Power BI
- NROL characterisation variations in arrival time of booked trains to worksites (rather than possessions), especially on complex possessions with high numbers of worksites and attending trains. The distribution of trains per worksite, trains per possession and trains attending multiple worksites in one shift can help understanding about how engineering trains are used within possessions and where problems relating to late arrival most often arise or create the greatest knock-on delays.
- PPS characterisation on how different work types, in terms of inspections, maintenance, renewals or enhancements, and work disciplines, such as track, drainage or signalling are carried out within possessions. Some types or work may be carried out in mostly shorter possessions, for example, or may be linked to possessions only later in the planning process. This would allow for a fuller understanding of how works deliverers - and access planners which prioritise the work deliverer's requests - impact the planning and delivery process.

Other data sets, such as the detailed records of each Schedule 4 compensation payment made by Network Rail to operators can also be explored further. In particular, a detailed analysis into which factors have the highest influence on the total compensation payment could be key to driving down total compensation costs, especially when combined with an estimator tool to simplify planning decisions.

Recommendation P6 Characterise the Possession Planning System (PPS) and Network Rail Online Logistics (NROL) and centralise a “data lake” that is accessible by BI tools.

Ease	Impact	Owner
Easy	Low	Access Planning Programme

Enabling Delivery through the National Framework

KR 2: Is there a clear line of sight from Network Rail's Activity Based Planning and Strategic Business Plans to possessions?

We can conclude that there is a clear and facilitated line of sight between Strategic Business Plans (SBPs) and Activity Based Planning (ABP) with regards to maintenance and track renewals. Possessions across sampled Regions are booked in accordance with these planning-based strategies.

KR 6: Are Network Rail's possession efficiency initiatives embedded and best practice shared?

We acknowledge that through the Infrastructure Strategy Board and Planning and Access Steering Board, some steps are being made to setup a central coordinated governance entity for coordinated national programmes. The process and governance surrounding this body is still in its infancy (E-C-0800).

There are several improvement initiatives in motion, however there is a clear lack of communication and coordination across Network Rail's devolved Regions and Routes, with respect to identifying and communicating Route initiatives. It is not consistently applied, and best practice is not effectively shared.

As Network Rail and the wider industry evolve and reform it will be important to make sure the role of national programmes enable Regional coordination and continue to share best practice effectively.

Recommendations

Centre of excellence for possessions

We recommend that the CoE for P3M is replicated in the SO under this entity to specifically focus on possessions. This hub's sole responsibility should be to collate, communicate and ensure specific simple information is communicated to the wider business (such as high level aims and objectives, cost, forecast benefits, owners and timescales). This should complement/amalgamate with the planners best practice forum.

It is our view that the devolvement and independence the Routes have gained should not be compromised. There are unique, replicable, and innovative initiatives across Routes. This culture of thinking should be maintained and fostered. For this reason, the "hub" should not direct activities, but identify, communicate and harmonise good practice with the aim of progressing of key initiatives. The benefits of this approach would be much reduced rework and miscommunication whilst enabling collaboration and innovation.

Recommendation NF1	Set-up a Centre of Excellence related to possessions in the System Operator. This should coordinate national programme benefits and share best practice from regional initiatives. This should complement/amalgamate with the planners best practice forum.		
	Ease	**Impact**	**Owner**
	Easy	Low	System Operator

KR 7: Does the current framework enable the industry to best deliver for passengers and funders?

We can conclude that Schedule 4[4] and the Notification Discount Mechanism is not fully understood by Network Rail and cost impact is dislocated from planning activities. We know that maximum discount is far too rarely secure, which is not in the interests of any stakeholders because the lost funds could be better spent on productive activities for the maintenance and operation of the network, which benefits TOCs, passengers, taxpayers and all concerned.

We conclude that there is a distinct lack of understanding regarding the Network Code, access cost and the impacts of disruption. This is the underlying issue at the heart of several inefficiencies in the system. There is a clear need to align governance of the Network Code (Part D specifically) mechanisms and the Track Access Agreements (Schedule 4 specifically) in unison with evolving industry commercial structures.

It is our view that the National Framework characterises a conflation of an engineering planning process with a set of commercial structures attached to it. This has over time become cumbersome (and complex) for the Route planning functions to navigate. The framework does not best deliver to passengers and funders, for the reasons discussed above.

The National Framework (specifically the Network Code and compensation mechanisms such as Schedule 4) requires cross-industry review and education to ensure that it drives efficient possession planning and delivers value to the industry. It must remain aligned to the structure of the industry in the long term as government reform is being implemented and operator commercial structures change. We have identified several areas where the National Framework does not facilitate a balanced consensus between Network Rail and operators (both passenger and freight). Whole industry value must be taken into consideration when determining access costs versus disruption. A holistic approach to determining “best use” is needed.

Our recommendations are far-reaching and challenging. However, consolidation and coordination of benefits would unlock efficiencies across the business. We conclude that the unique pressure placed on the industry by the COVID-19 crisis and the subsequent mitigations being implemented (such as ERMAs) in conjunction with wider industry reform, presents a unique prospect in time.

Recommendations

Industry value and cost model

We recommend that a wider model of industry risk, cost and value should be developed that takes into consideration asset risk, asset lifecycle cost, and disruption. This should be based on Green Book principles that underpin infrastructure investment decision-making within the UK government. Network Rail should also consolidate the quantum of rights, widows - based approach and socio-economic principles within the Network Code. Actions should include:

- The model should be developed based on two key concepts: cost of access and disruption impacts
- Development of a roadmap to achieve benefits
- Consolidation of governance under one national programme such as Intelligent Infrastructure Planning workstream
- Consideration should be given to asset risk and asset lifecycle cost
- Integration of this model with the DWWP. This should align quantitative risk models, optimism bias and benchmarked access costs.

[4] Note: To get the maximum value for the taxpayer from operator franchises (and to protect non-franchise operators from risk they cannot directly control) there is an automatic system of payments which seeks to leave train operators in a financially neutral position when their train services are unable to run as originally envisaged due to planned disruption. This regime is called Schedule 4 (E-D-0574).

The outcome will enable impacted stakeholders to communicate more effectively and efficiently and understand the relative value of access and disruption to each stakeholder. It will help drive improvements to the frameworks, systems and processes that drive true whole industry value. If this model is refined to a point that it is trusted by the industry, it could be included in track access contracts.

Recommendation NF2

We recommend that a wider model of industry risk, cost and value should be developed that takes into consideration asset risk, asset lifecycle cost, and disruption. This should be based on Green Book principles that underpin infrastructure investment decision-making within the UK government. Network Rail should also consolidate the quantum of rights, widows - based approach and socio-economic principles within the Network Code.

Ease	Impact	Owner
Medium	High	System Operator

Network Code review

We recommend that as part of Period Review 2023 (PR23) and the next Control Period planning (CP7) preparations, the System Operator (SO) should consolidate and produce a white paper detailing the future blueprint of the Network Code. As part of this review the following should be considered:

- Consolidation of governance under one national programme such as GRAI
- Education and improved level of understanding of Part D of the Network Code
- Education and level of understanding of the access negotiation process
- Future legislation strategy
- Agreement of a direct incentive in the Network Code for operators to make it easy for Network Rail to understand their commercials and to agree access early.

To action:

- Detail why the T minus 7 lock down is so ineffective
- Define good and bad late changes
- Determining the terms of reference for the value and cost model
- Finally, the development of a joint industry roadmap. This roadmap should identify the Network Codes future in line with changing commercial arrangements away from operators' franchise/concessionary contracts and how it will act in a future of direct award contracts.

We acknowledge that changes to the Network Code are difficult given conflicting stakeholder requirements. However, we believe now is an opportune moment to make these reforms in view of the significant changes already made to the industry in 2020. If correctly implemented, these changes will ensure the correct incentives are in place to drive whole industry value. The outcome should be to achieve industry consensus and commitment to implement changes to the Network Code, and a working process for periodic review of the same. Whilst this outcome clearly requires effort from several key industry bodies, we recommend that NR acts as project manager and takes responsibility for setting project timescales and developing implementation plans.

Recommendation NF3

To inform the Period Review 2023 (PR23) and the next Control Period planning (CP7) preparations, there should be production of a white paper detailing a future strategy for the Network Code. This must set out a programme to align governance of Part D of the Network Code and access negotiation process protocols.

Ease	Impact	Owner
Hard	Medium	GRAI

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Introduction

1. Introduction

1.1 Purpose of Report

The purpose of this report is to document the findings and conclusions following the review that assesses Network Rail Region's processes for managing possessions. As per the Statement of Works (SoW), it provides an independent opinion on Key Requirements (KRs).

1.2 Scope and Objectives

1.2.1 Scope

A possession is the term used by the rail industry for the action of placing special protective measures to prevent access to sections of track by unauthorised trains. This is done to enable safe asset intervention activities (maintenance, renewals, refurbishment, or enhancements) by maintenance and engineering staff. Network Rail define a possession as:

"When a section of track is required for maintenance and trains cannot run, it is handed over by the operators to the engineers, who take "possession". Special protective measures are used to prevent access by unauthorised trains. When the track is returned to the operators, the engineers give up possession". (E-C-0761)

The existing framework - along with its associated governances, assurance and processes - aims to instil discipline and efficiency when undertaking possessions.

GHD was appointed by the Office of Rail and Road (ORR) and Network Rail as the Independent Reporter (IR) to provide assurance that Network Rail's Regions plan and use possessions efficiently, and that the current framework including the Network Code and track access contracts (including Schedule 4) surrounding possessions enable the industry to deliver for passengers, freight users and funders.

Key requirements (KR) include:

- KR 1 - How Regions determine the level of access needed
- KR 2 - Whether there is a clear line of sight from Network Rail's Activity Based Planning and Strategic Business Plans to possessions that are booked
- KR 3 - How efficient Regions are at planning and delivering possessions work. This should consider the current industry framework surrounding possession planning
- KR 4 - How Regions balance efficiency and contingency when planning and using possessions
- KR 5 - How Network Rail records and uses information relating to possessions to inform decision making
- KR 6 - The extent to which Network Rail's possession efficiency initiatives are embedded and how best practice is shared
- KR 7 - Whether the current framework surrounding possessions enables the industry to best deliver for passengers and funders.

1.2.2 Objectives

We interpreted the requirements along two pillars to address the scope:

- Are Network Rail's application of **processes** surrounding the planning and delivery of possessions efficient?
- Does the possession planning and delivery **framework** enable Network Rail to best deliver for the passengers and funders?

1.2.3 Sampling

Whilst the sampling of the review was limited to maintenance and track renewals, the idiosyncrasies across types of work (asset interventions), types of access arrangements (Sections 4, 5 & 7 of the Engineering Access Statement), and the methods of protection (Red Zone or Open Line, line blockages and possessions) are highly varied and intertwined. For example, a maintenance inspection is short in duration and non-intrusive. It can take place in Red Zone or Open Line, a line blockage, or a possession.

1.3 Methodical Approach and Report Structure

The study methodology followed a 3-stage approach:

- Initiation: to define and plan the study around the KRs
- Delivery: data collection and process maturity, involving extensive consultation with each Region, Route and a selection of Alliances and Maintenance Delivery Units (MDUs)
- Reporting: information mapping, analysis, and the documentation of results.

We consulted over 100 stakeholders to understand their perspectives of the framework and process. This included evidence-based statements along addressing the KRs. We gathered and analysed large data extracts from the Possession Planning System (PPS) and the Network Rail Online Logistics (NROL).

To provide clarity against the KR's our report is presented in two sections.

To determine efficiency in the context of possession's and provide a structured framework for providing an independent opinion on its efficiency, we undertook a qualitative assessment and data analysis of the possessions planning and delivery process[5]. This included samples against process points. Regions and Routes vary widely in their access needs — determined by the network's geographical context, capacity as well the infrastructural assets, and the demands put on the network.

Section 2 considers the scope related to the application of processes surrounding the planning and delivery of possessions, and specifically covers requirements 1, 3, 4 and 5. Each key requirement is addressed in terms of its context (i.e. the relevant processes) and the assessment of findings, before overall conclusions are drawn.

Section 3 considers the mandate related to whether the possession planning and delivery framework enables Network Rail to best deliver for the passengers and funders. Structured in a similar way to Section 2, it directly addresses the remaining key requirements 2, 6 and 7.

The end point was consideration of the balance between necessary disruption to customers for upgrading and maintaining the network, and the cost to taxpayers and funders who use the network for travel and freight. Striking this balance required taking a whole industry value perspective with regards to the commercial operators (passenger and freight).

Based on evidence gathered from our review, we comment on areas that are working well - including good practice - and have identified areas for improvement in response to the KRs.

We are grateful to all contributors, for taking the time to assist with this Independent Report and for providing such open and honest information.

[5] Note: This included analysis of the network complexity, worksites per possession, Schedule 4 compensation, number of disputes and reworked, short notice and cancelled plans.

1.4 Overview

1.4.1 The National Framework

The Department for Transport (DfT) has overall responsibility for the legislative and legal aspects with regards to most of the railway network. This includes the work of Network Rail[6] in funding major projects and contracting rail services[7], both regulated and overseen by the ORR. Under the Railways Act 1993, anyone seeking access to the rail network to operate trains requires a track access contract with the relevant facility owner granting permission to use that facility. Network Rail is the facility owner of the main rail network in Great Britain.

There are several conditions of Network Rail's network license that drive it to meet the needs of train operators. Condition 1 (Network Management) sets out Network Rail's core obligations to secure the operation, maintenance, renewal and enhancement of the network in order to satisfy the reasonable requirements of its customers and funders. This covers both the quality and capability of the network and the facilitation of railway service performance. The National Framework that facilitates possession planning and delivery consists of:

- Network Rail governance including the Access Rights Framework (ARF), Access Planning Framework (APF), National Principles[8], the Network Code[9] including the Operational Rules, Track Access contracts and Schedule 4 & 8 of the compensation mechanisms
- Supporting digital systems and architecture
- National programmes and regional initiatives that deliver benefits related to the mandate.

The role of Network Rail's System Operator (SO)

The role of System Operator (SO) within Network Rail takes responsibility for whole system integration of the rail network along with the framework that determines which operators can use it (the sale of access rights) and when (the timetable). The SO has accountability for the Access Rights Framework (ARF), Access Planning Framework (APF) at a national level, and definition of the processes and governance arrangements in which the devolved Routes operate.

To facilitate this, the SO determines;

- What capacity is available;
- Publishes this information; and
- Ultimately determines how to make best use of the available capacity for engineering purposes.

To facilitate access in the available capacity the industry has what is called the Network Code. The Network Code is the key governance mechanism that sets out the processes and timescales that inform the timetable development and is a set of contractual rules that are incorporated into each track access agreement between Network Rail (managed by the SO) and all train operators. These operational rules cover those areas where all parties are obliged to work together to the same standards and timescales including:

- Developing the timetable
- Making changes to the network
- Standards of performance monitoring
- Resolving contractual disputes
- Managing operational disruption.

[6] Note: Network Rail operates under a licence issued by the Secretary of State for Transport which the ORR oversee and enforce.
[7] Note: However, in some parts of the country, the Devolved Administrations, sub-national transport bodies and city regions are involved in the specification and funding of services and infrastructure, ranging from full devolved responsibilities to more informal collaboration.
[8] Note: The National Principles detail which diversionary routes are available when track sections are blocked and the approximate passenger diversion time and method. There are several rules that dictate how access can be planned at a national level.
[9] Note: The Network Code is a common set of rules and industry procedures that apply to all parties who have a contractual right of access to the track owned and operated by Network Rail.

Access Rights Framework (ARF)

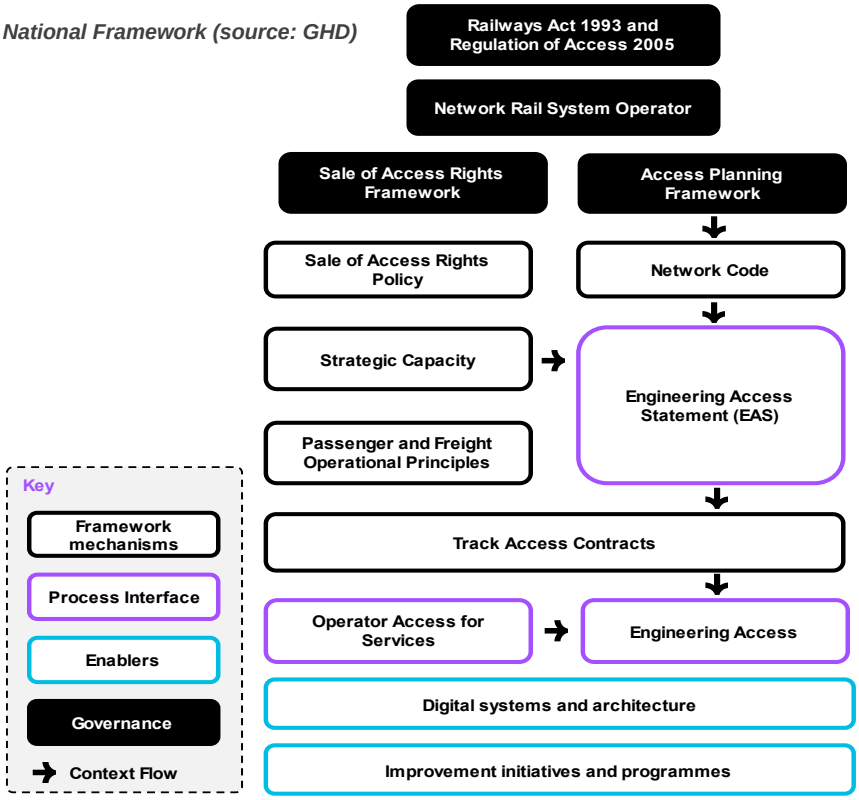
The SO facilitates Network Rail's decisions on whether to support an operator's application for access rights. This is undertaken under the principle of making 'best use' of capacity throughout the network, reflecting the priorities of funders and operators within the overall framework while complying with licensing and statutory requirements.

The undertaking of 'best use' (which links to **KR7** of the IRs scope) is managed within Network Rail by a framework that consists of Network Rail's Access Policy, its sale of access rights process, and the creation of the network-wide timetable.

Access Planning Framework (APF)

The SO oversees the Access Planning Framework - the national framework for devolved engineering access activities that are carried out by Routes. The APF framework facilitates the Network Code including the Track Access contracts and Schedule 4 & 8 of the compensation mechanisms. Track access is supported through operational rules including the Engineering Access Statement (EAS) and the Timetable Planning Rules (TPR). The APF and its components relate to **KR1** of the reviews scope. This framework has multiple process interfaces including the application of the processes that sit in the Network Services Directorate and relate to **KR2, KR3** and **KR4** of the reviews scope.

Figure 1.1 The National Framework (source: GHD)



Digital systems and architecture

The processes in the frameworks cited above are supported by national enterprise grade systems. Principal among these are the Possession Planning System (PPS) and Network Rail Online Logistics (NROL). Others related to the scope and **KR5** include:

- Possession Planning System (PPS)
- Network Rail Online Logistics (NROL)
- Green Zone Access Manager (GZAM)
- Various Work Order/Document Management Systems.

Improvement initiatives and programmes

The final determination of the 2018 periodic review (PR18) for Control Period 6 (CP6) set out ambitions that Network Rail will save £3.5bn by 2024[10]. Network Rail has publicly noted that there are around 1,000 initiatives covering 23 key efficiency areas[11]. There are several nationwide improvement initiatives relating to related to the scope and KRs and possession planning and delivery. Key initiatives that have a direct bearing on **KR6** include:

- Efficiency Improvement Programme (EIP)
- Access Planning Programme (APP)
- Governance, Risk, Assurance, and Improvement (GRAI)
- Intelligent Infrastructure (II).

1.4.2 Processes that facilitate planning and delivery

Processes that translate the ARF (and network capacity) into the APF (and agreed through the Network Code) into delivery, primarily sit with the Network Service Directorate (Head of Operations Principles & Standards). The processes and associated guidelines include:

- Operational rules including the Engineering Access Statement (EAS) and the Timetable Planning Rules (TPR)
- Principles, Timescales and Functional Responsibilities for Engineering Work, Access and Heavy Resource Planning[12]
- Possession of The Line for Engineering Work Delivery Requirements[13]
- Governance for Railway Investment Projects (GRIP)[14] [15]
- Delivering Work within Possessions (DWWP)16. Note that Maintenance have their own DWWP standard[17].

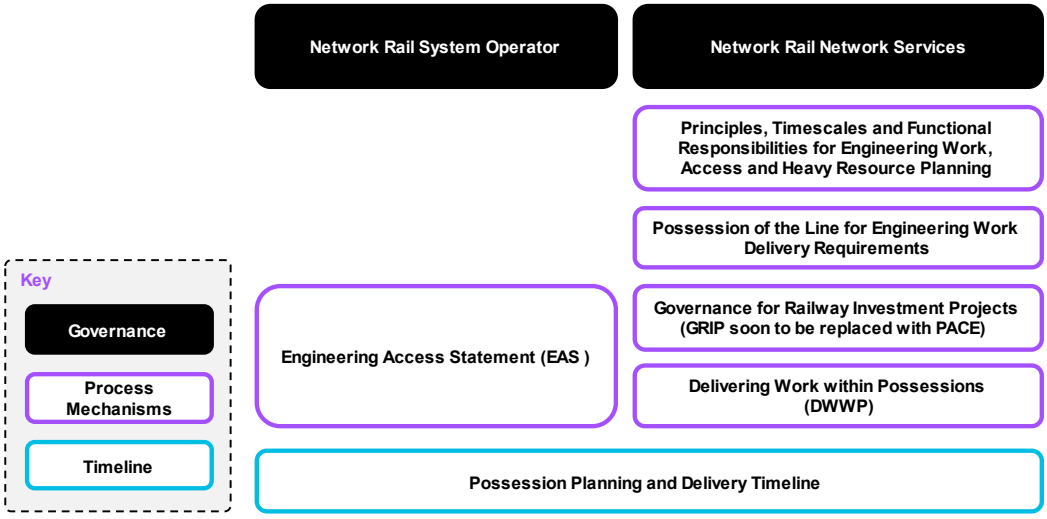


Figure 1.2 Process Mechanisms (source: GHD)

[10] Retrieved from: https://www.orr.gov.uk/monitoring-regulation/rail/networks/network-rail/price-controls/pr18/publications/final-determination
[11] Retrieved from: https://www.networkrail.co.uk/industry-and-commercial/efficient-and-dependable-partner/
[12] Note: NR/L2/OPS/202 (Issue: 7) Principles, Timescales and Functional Responsibilities for Engineering Work, Access and Heavy Resource Planning: These are national possession planning standards. This business process defines the business planning process that enables engineering access to Network Rail Managed Infrastructure to undertake inspection, maintenance, renewal and enhancement of the network in compliance with the Network Code and with the objective of controlling the safety and business risks associated with arrangements for engineering access his business process describes the key principles, activities, timescales, and associated work plan information necessary when planning the engineering access and resources .
[13] Note: NR/L3/OPS/303 [Issue: 4] T3 Possession of The Line for Engineering Work Delivery Requirements: The purpose of this standard is (in conjunction with GE/RT8000/T3 Possession of the line for engineering work and associated Handbooks), to inform Network Rail staff and framework contractors the responsibilities and delivery requirements associated with delivering possession of the line for engineering work.
[14] Note: NR/L2/INI/P3M/101
[15] Note: Under Project Speed this is now being progressively replaced with Project Acceleration in a Controlled Environment (PACE) which Network rail hopes will, "deliver projects more quickly, at lower cost and higher quality".
[16] NR/L3/INI/CP0064: Delivering Work within Possessions (DWWP): This business process lays the ways of working required to reduce the risk of a possession overrun and the subsequent impact on both the travelling public and operational railway. In particular, this process defines the level of contingency required within eligible possessions (those containing high-risk "red worksites" as determined by the DWWP criteria) to avoid an overrun.
[17] Note: NR/L3/MTC/MG0210

Efficiency of the Possessions Process

2. Efficiency of Network Rail's Possessions Process

2.1 Introduction

Section 2 considers the mandate related to the efficiency of processes surrounding the planning and delivery of possessions, and specifically covers mandate requirements 1, 3, 4 and 5.

We observed significant variation in how Regions apply centralised planning and delivery processes. The underpinning timelines overlap considerably. We provide context of the guidelines, standards and the interfaces these have with the frameworks at the start of each section to inform understanding.

Our assessment and findings are articulated at the end of each section and are based on the evidence and objective assessment. At the conclusion of the section, we propose practical recommendations and associated actions.

It is a complex and dynamic landscape in the rail industry. The process is driven by committed and experienced staff who deal with its intricacies daily. How Regions facilitate the process is explored through the National Framework governance and its standards and guidelines.

Data and information relating to the possession planning process is principally held in a small number of enterprise systems. These are predominantly the Possession Planning System (PPS) and the Network Rail Online Logistics (NROL) databases. We also explore the National Framework data and information evidence as it is moved through the process and between stakeholder groups.

2.2 KR1: How the Regions determine the level of access

2.2.1 Overview

The determination of access needs essentially takes place from Stage 1 (Control Period Planning) to Stage 3 (EAS to CPPP)[18]. The key parts of the Framework covered across this section are:

- Application of the Access Planning Framework (APF)
- Application of the Engineering Access Statement (EAS) which facilitates agreement on the possession window.
- Common themes that impact efficiency.

2.2.2 Application context

Governance

The System Operator (SO) facilitates Network Rail's decisions on whether to support an operator's application to the ORR for access rights. Access rights need to carefully balance the needs of operators with the flexibility that optimises use of the network and creates the most effective and efficient timetable (using the industry agreed decision criteria). All this must be done consistently with Network Rail's operating licence and in accordance with the industry's Network Code.

The Access Planning Framework (and its process, this sub-section's focus) helps practitioners and stakeholders manage the sometimes conflicting (and complex) activities described above, so that there is consistency in its determination of access for engineering purposes.

[18] Reference: the six stages of possession planning and delivery (this report: Section 1)

Access Planning Framework (APF)

The aim of the APF is to ensure that when access to the network for engineering activity is required, it is taken at the best time and that the reduced level of capacity is managed in the best interests of the industry, including passengers and freight customers. It facilitates and integrates the SO (including capacity planning), capital delivery, the Regions and Routes as well as the operators (E-D-0212). Network Rail uses national rules and standards to govern the methods of protection to ensure the safety of its track workers and meet its vision of getting everyone home safe every day.

The primary mechanism used for this is the Engineering Access Statement (EAS), which facilitates the agreement on the access window.

The Engineering Access Statement (EAS)

The EAS facilitates allowance of network capacity for engineering access that is potentially disruptive to the Train Operating Company (TOC) and Freight Operating Company (FOC) timetabled services.

The EAS is first published as draft 64 weeks prior to the commencement of the working timetable[19]. This is called Version 0 and known as the Principal Timetable. It is then iterated through consultation with the operators and other relevant stakeholders through comments against relevant possessions. The iterations of the timetable describe six-month sections of the year (also known as the Subsidiary Timetable). These iterations are called Versions 1, 2, 3 & 4.

They are defined as:

- Version 1[20] is a refined version of V0, although with more focus on the first half of the year, describing possessions from December to December. It is issued in October each year
- Version 2 is the final draft of the EAS for the months Dec to May. It is issued in February each year
- Version 3 is a refined draft for the months May to Dec. It is issued in March each year
- Version 4 is the final draft for the months May to Dec. It is issued in July each year.

The sequence of events that take place are outlined in Table 2.1. There are three milestones to highlight in this timeline:

- T-30 - the Draft Periodic Possession Plan (DPPP) - the final opportunity for operators and other stakeholders to suggest amendments to the timetable prior to publishing
- T-26 - the Confirmed Periodic Possession Plan (CPPP) - the final access plan on which the train timetable bids are put in
- T-12 - the Informed Traveller process - a rolling process which aims to ensure that any changes to the base timetable due to engineering works are finalised 12 weeks before each individual timetable week.

[19] Note: The working timetable (WTT) is the rail industry's version of the public national timetable. It shows all movements on the rail network including freight trains, empty trains and those coming in and out of depots. It also includes our unique identification codes for each train, and intermediate times for journeys, including which stations a train is not scheduled to stop at.

[20] Note: The reason that Version 1 and 3 appear to be published at the same time in the table below is because "D-"refers to the number of weeks until the respective timetable is published. In the case of Version 0, this is the primary timetable and covers the entire year. In the case of the other versions, this is the Subsidiary timetable and refers to the bi-annual timetable. Thus, 59 weeks from Version 1, issued in October, is December; and from Version 3, published in March, is May.

Table 2.1 Overview of access planning process and timescales (source: (E-D-0642), (E-D-0637))

Timescales	Activities
Pre-Version 0	Work integration Creation of possessions Strategic review of resource profile National integration Informal FOC and TOC consultation on disruptive access Assessment of deliverability
D-64	Version 0 Draft EAS
D-59	Version 1 and Version 3 EAS Proposal
D-54	Operator Response to EAS Proposal
D-44	Version 2 and Version 4 Final EAS
D-26	Last opportunity fo**r** maximum discount **on** Schedule 4 compensation payments
T-37	PPS deadline (for disruptive access) and NROL deadline
T-35	Period Plan Review (Pre-DPPP meeting)
T-30	Draft Period Possession Plan (DPPP)
T-27	DPPP Trains Meeting
T-26	Confirmed Period Possession Plan (CPPP)
T-22	Last opportunity for medium discount on Schedule 4 possession payments
T-12	Upload amended timetable for Informed Traveller deadline
	Plan development within possessions subject to amended timetable and access opportunities
T-7	Deadline for PPS applications no later than T-7 Change control process applies no later than T-7 for Engineering Trains and access
T-5	Weekly plan reviews (no later than T-5)
T-4	Draft Weekly Operating Notice (Draft WON) Change control process applies from T-4 for OTMs
T-10 days	Weekly plan review (T-10 days)
T-8 days	Weekly Operating Notice (WON)
	Person in Charge of Possession (PICOP) Meeting (no later than T-2 days)
T-2 days	Supplement Weekly Operating Notice (WON)
T-1 day	Last opportunity for minimum discount on Schedule 4 possession payments (Schedule 8 is applied instead)
Post T-2 days	Wires / Manual Supplement (as mandated by Route)

Types of access windows

The EAS consists of two parts. The first part is a short national overview, which sets out the planning rules for the primary benefit of those who require engineering (as opposed to train) access to the network. The second part contains route-specific information and provides details of planned surrender of network use for maintenance, renewal and enhancement work. There are three sections in the EAS statement that are relevant to this review. They are:

- **Section 4:** 'Standard' access, also known as 'white space'. This is outside of the operational day of the route where there are no booked services. In branch lines this can be several hours every evening, but in lines that carry sleeper trains and freight services this can be severely reduced
- **Section 5:** 'Midweek' access, also known as 'cyclical'. This is typically on a six or twelve-week rotation (though many variations exist) and allows more time for maintenance activities in extensions of 'standard' Section 4 opportunities. While these opportunities can be changed every year, they are typically rolled over year-on-year
- **Section 7:** 'Disruptive' possessions that do interfere with the timetable of freight and passenger trains. These possessions can be long, sometimes up to weeks, but most typically a full day or a full weekend. They are most often used for works out of the ordinary, such as renewals and enhancements. Typically, disruptive possessions are agreed between Network Rail and operators because of the necessity to complete one complex enhancement or renewal at a specific location. This large possession may be packed with multiple worksites as delivery day gets closer, a process known as 'piggybacking' (when maligned) or as 'putting flesh on the bones' (when encouraged).

These three sections in the statement define and ultimately determine the type of engineering access needed and therefore what is booked. Figure 2.1 represents the access window profile over a three-year period.

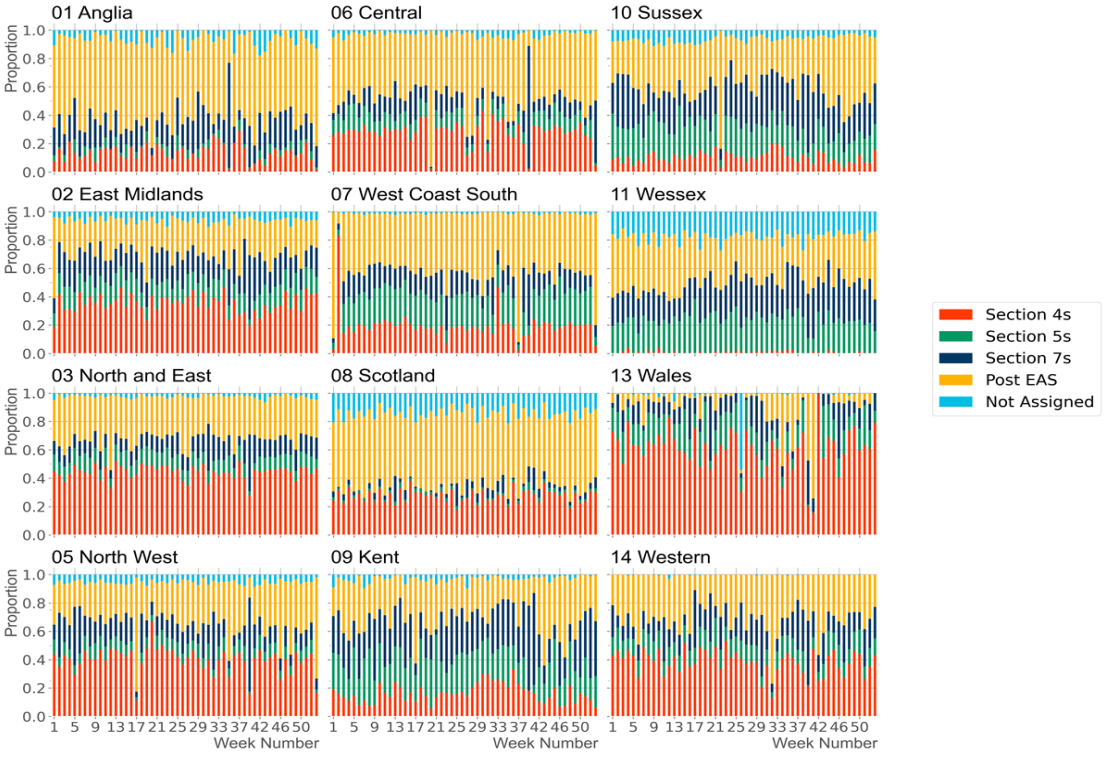


Figure 2.1 Aggregate EAS (hours) by access type, route[21], over a proportionate three-year[22] period. (source: PPS data)

[21] Note: Retrospective Route structure
[22] Note: Between April 2017 – April 2020

2.2.3 Assessment and findings

Theme 1: Route variables impacts

The Route context and complexity has a material impact on the nature of possessions demanded across the Regions and therefore what access windows may be disrupted. There are two broad categories related to this complexity:

- Asset based complexity
- Usage based complexity.

To consider the differences between Routes, it is important to acknowledge that the network idiosyncrasies within these geographies have deep underlying and varying asset conditions and vary in both usage demand and physical properties of their networks:

- **Asset complexity:** London terminals 'throats[23]' network with a high number of switches and crossings requires higher levels of maintenance due to degradable and high usage assets. Areas of the network with a higher number of switches and crossings can require more frequent maintenance due to a higher number of maintainable assets, but also indicates a greater density of track junctions and therefore, on average, lower travel distances required to attend worksites. This is referred to below as 'Asset Complexity'
- **Isolation complexity:** Possessions that include isolation from electrified lines (both AC and DC) require higher safety protocols at start up and hand back to isolate. Possessions of the same overall duration in electrified lines can have longer durations overall for the same volume of work delivery
- **Track class complexity:** Track categories are defined by tonnage and speed. The track category defines the specification. For instance, the highest category will require 300 mm of ballast, concrete sleepers, UIC 60 rail etc. It is a key variable that dictates the frequency of inspection and maintenance.

Figure 2.2 illustrates the significant variation in asset complexity relating to track class[24], electrified track and total track aggregates across the Regions. Increased usage of the network can increase the demand for longer operational days, meaning earlier first trains and later last trains.

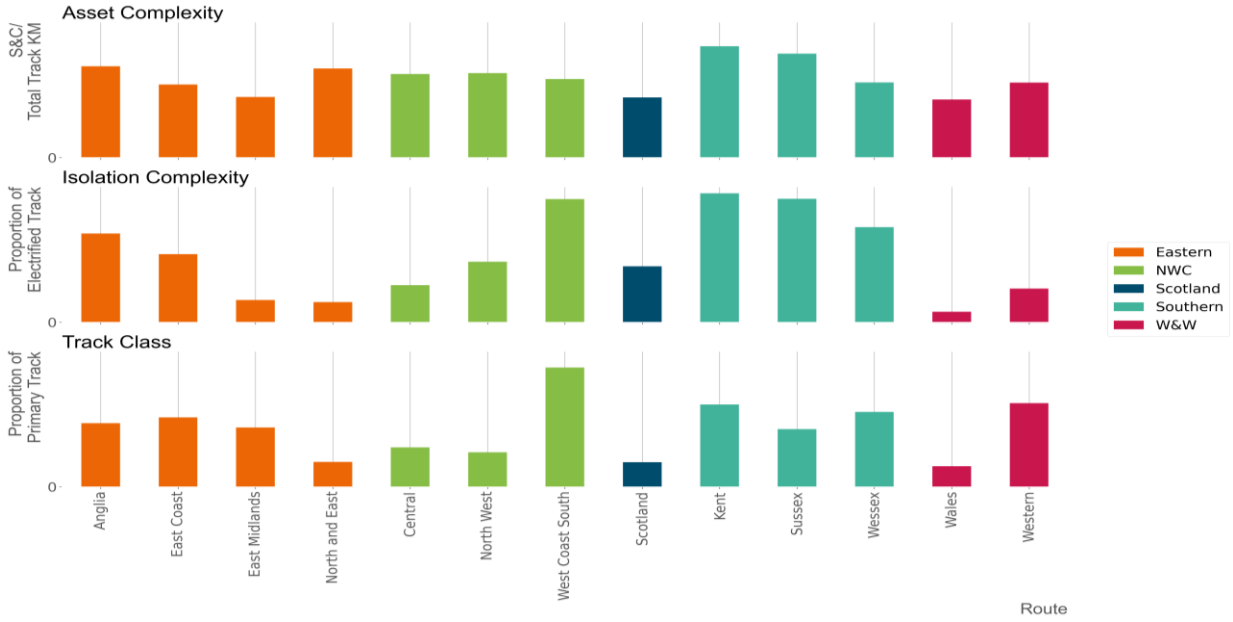


Figure 2.2 Complexity aggregates by Route (source: PPS and NROL data E-D-0594)

[23] Note: Constricted area at the end of a railway station where running lines divide into platform tracks.

[24] Note: Rail is graded by weight over a standard length. Heavier rail can support greater axle loads and higher train speeds without sustaining damage than lighter rail, but at a greater cost. In North America and the United Kingdom, rail is graded by its linear density in pounds per yard.

This has a direct impact on the maximum duration of Section 4 possessions which occur outside the operational day. Higher passenger usage also increases the cost of disruption compensation payments under the Schedule 4 regime, by either increasing the number of trains affected or increasing the Busyness Factor of the revenue calculations.

While passengers make up most of the traffic on all Routes, freight traffic is also an important factor for determining how network usage affects possession planning. Freight services, and sometimes cross route traffic, are more likely to run at night, so they can have a large impact on access opportunities, either cutting long possessions or making some short possessions non-viable. FOCs often work at different timescales to passenger operators, adding complexity to the planning process.

Figure 2.3 shows the significant variation between Routes in both train usage and the ratios between passenger and freight usage. Higher usage drives higher asset degradation as well as less access and higher access cost and impacts how the routes book possessions.

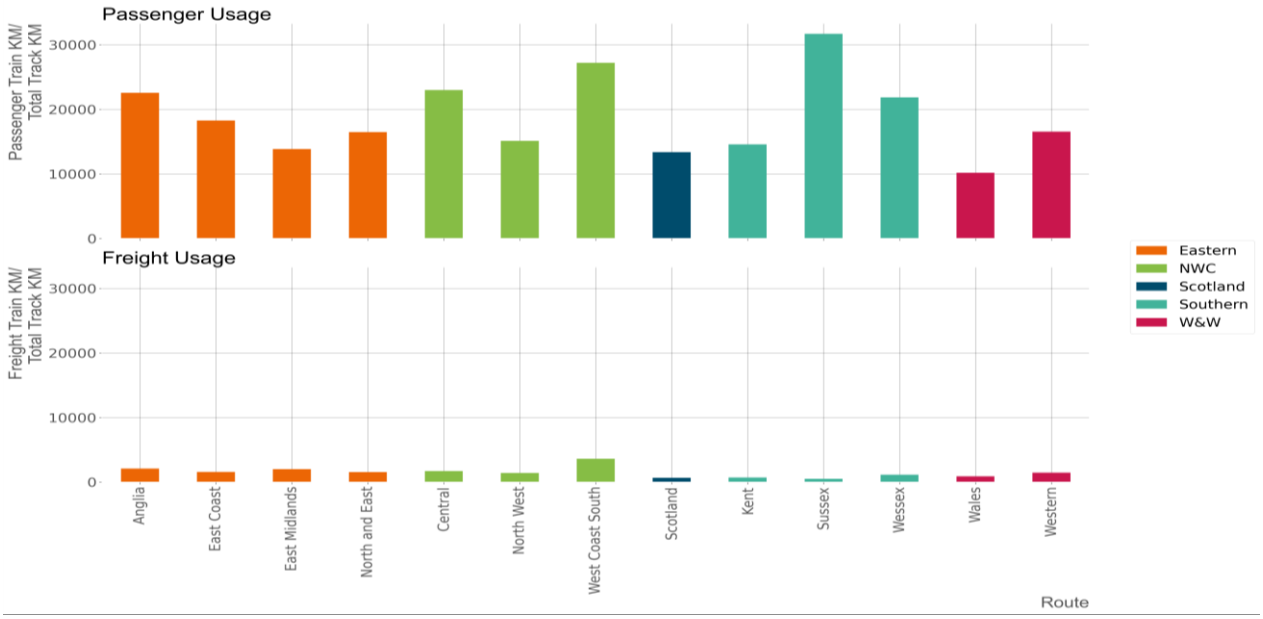


Figure 2.3 Passenger and freight usage data in kilometres by Route (source: PPS and NROL E-D-0594)

Theme 2: Capacity and unavoidable disruption

Where routes do book possessions outside of the EAS's Section 4, Section 5 and Section 7, most often because the possession is planned after the timescales of EAS publication, these possessions vary widely in how disruptive they are to passenger and freight services.

After the Combined Periodic Possession Plan (CPPP) is published, the operators will bid for timetable slots in the upcoming planning period.

To penalise any changes after this point, revenue loss compensation payments paid to operators by Network under Schedule 4 carry the maximum possible Notification Factor discount. This means that any further disruption to planned services will incur a higher cost to Network Rail. This is inefficient and drives cost into possession works.

Late changes within seven weeks of delivery can only be permitted where they are business or safety critical, whereas those within four weeks must be safety critical. At this stage of the process, possession plans are further developed, following standards 202, 303 and 019. During this period, reactive work that requires immediate attention (i.e. track defects that must be addressed within a number of days or weeks for Network Rail to remain compliant) will be flagged by the MDUs.

The defect correction work is then planned by either:

- Taking advantage of existing 'white space' that doesn't cause disruption to any planned services

- Adding a worksite to an existing possession if there is enough time to plan safely
- Agreeing additional disruptive possession with operators to deliver the work if it is critical.

Taking into consideration above, we note that:

- If a new possession is required, this will be captured as a 'Non-Engineering Access Statement' or 'Late Notice' possession in PPS. This period is where the largest number of changes occur to possession plans, including cancellations as access windows and work specification is developed.
- Changes after the T-7 milestone (known as 'late changes') are monitored by the National Access Planning team to minimise impact on train planning (E-C-0095) and by the Routes and regions to mitigate Notification Factor penalties and safety risk
- Our analysis in Figure 2.4 shows the proportion of total post EAS possession hours by disruption type across the Routes.

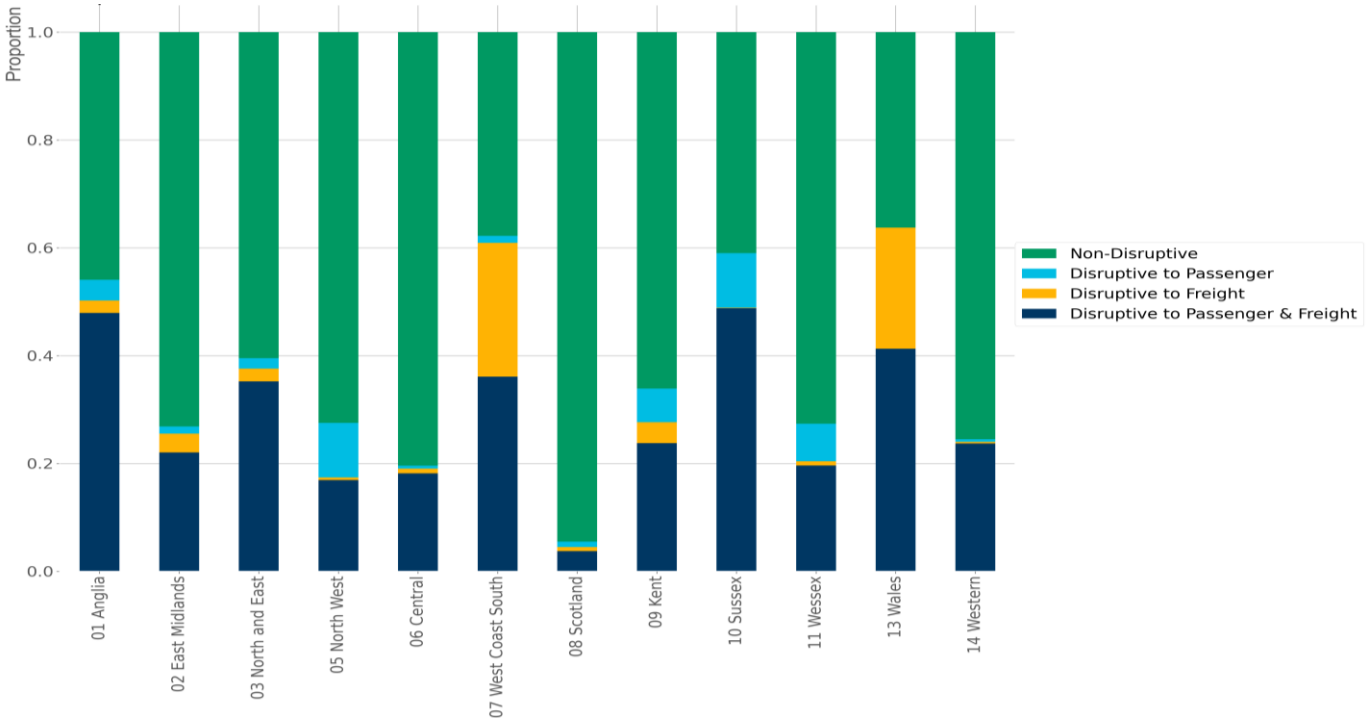


Figure 2.4 Proportion of total post EAS possession hours by disruption type (source: PPS)

We found that:

- Where Routes do book possessions outside of the EAS (Section 4, Section 5 and Section 7), it is most often because the possession is planned after the timescales of EAS publication
- Short-notice possession plans are especially common in two Routes in quite different circumstances, Anglia and Scotland
- Scotland has significantly different governance structures and funding arrangements, few operators and an alliance style supply chain to undertake maintenance. In the consultations it was noted that there is a robust relationship with the operators (E-C-0655).
- Anglia in contrast has a multitude of operators, the Great Eastern Mainline, orbital routes and operate some of the busiest and most congested rail lines in the country
- Sussex, Kent and West Coast South have the least hours in Section 4 possessions, which are the least disruptive to train services, and take relatively more Section 5 possessions, which are cyclical and mildly disruptive
- Anglia, Sussex and West Coast South have nearly half of such hours tagged to Post EAS access type. This is disruptive to both passenger and freight services

- A high proportion of Wales' Post EAS type possessions were highly disruptive. Their small overall volume of possessions of the Post EAS type means this high proportion nevertheless represents a small degree of disruption to passenger and freight services
- North West and Central has the fewest posting to Post EAS access type
- Consultees aired different views about whether change to possessions after the issue of the CPPP was 'sometimes bad' or 'always bad' (E-C-0761). We conclude that changes have not been adequately defined
- There are differing processes across Network Rail to manage 'late change lockdown' at T-7, where changes to possession plans are ostensibly limited to those deemed business or safety critical (E-C-0634), (E-C-0407), (E-C-0591). There is no one single lockdown mechanism
- The two differentiating cases of Anglia and Scotland highlight that there is a key inefficiency in determining access, managing late lockdown and is exasperated by network extent, complexity and service demand.

Theme 3: Planning early and efficient use of Section 4 space

A key driver of the unit costs of engineering work undertaken is the amount of actual track time available to the work deliverers. This comprises the overall time window available less time taken to start up and hand back the possession. Our analysis shows that:

- Section 4 possessions are being squeezed, becoming shorter and fewer due to the pressure to create a 24/7 railway and increase the number of services, both passenger and freight. The average duration of Section 4 possessions is decreasing in most Regions
- Decreases in these windows are most clearly observed in Sussex, Wessex, North & East and Anglia
- The average duration of these possessions is notably much higher in some Regions than others (around 7 hours in Wales & Western compared to around 5 hours in Kent, for example)
- Shorter average Section 4 possessions are generally correlated to higher levels of passenger traffic, apart from Scotland, which has low passenger volumes and a short Section 4 duration average.

Figure 2.5 Average Section 4 possession duration by Route (source: PPS)

2.2.4 Conclusions

How do the Regions determine the level of access need?

In broad terms, the level of access needed for possessions by Routes is driven by the network context and asset characteristics in that location and the type of work needed, leading to the type of engineering access and the protection required. Track usage adds to the variable needs for the access window that can vary significantly across the Regions.

The current lockdown of changes at seven weeks or closer to delivery appears to be ineffective. We can deduce this judging by the volume of changes that still occur during that time. Late changes should be considering the alternatives. In some cases, not allowing a late change may itself carry business or safety risks - for example, where it leaves a defect unaddressed for several weeks. Access is determined through a series of consultations across the EAS timeline and a shoehorn of work into the timetables white space. We conclude that this comes with efficiency implications and cost.

Capacity and the drive to squeeze the timetable is a key restraint in Regional teams' determination of the level of access needed. This is not reflected as shorter possession durations, but a shift away from Section 4 possessions altogether. Factors that are affecting efficiency with regards to determining access include:

- Available white space after capacity has been determined
- The cost of disruption
- Lockdowns and changes to the CPPP.

2.3 KR 3: Efficiency of Regions at planning and delivering possessions work

2.3.1 Overview

There is a high level of interconnection between possessions planning and delivery and other processes (including many external to Network Rail). We observed common themes that determine how efficient the Regions are in planning and delivering possessions work. Key elements in this section include:

- Application of access and possession planning processes
- Application of delivery processes
- Common themes that impact efficiency covered in this section include:
  - Reworked, short notice and cancelled plans
  - National resources constraints which are limited and finite. Does materialise into delivery
  - Worksite per possession and lost work in possessions and whether delivery and access windows are maximised.

2.3.2 Application context

Planning

One fixed rule in **possession planning** is that it is not permitted to close both the West Coast Main Line (WCML) and East Coast Main Line (ECML) routes to Scotland at the same time. North-south route coordination is generally good, but coordination elsewhere is not as efficient. TfL have played an important role in the coordination process, seen using Harrow and Wealdstone as a terminus for Virgin Trains and West Midland Trains (WMT) during the Easter and May Bank Holiday blockades. Undoubtedly, there is an important role to play for similar regional transport authorities to assist coordination of future possessions (E-D-0918).

External events also make possession planning more challenging. For example, the requirement to keep a period of 3 weeks clear during the 2022 Commonwealth Games in Birmingham or the decision to move Early May Bank Holiday 2020 to coincide with 75th Anniversary of Victory in Europe Day (VE) celebrations. Whilst existing processes are largely able to deal with these special events, the scale of the works in CP6 provided some challenges to ensure work could be sequenced correctly and delivered in a way that minimises passenger disruption (E-D-0918). A further issue is that, in most cases, operators wish to keep open busy holiday routes during the summer, especially at weekends. As a result, some critical work can be deferred until winter, but then bad weather is more likely to mean that work gets cancelled. These factors need to be considered when planning possessions. (E-D-0918).

It is often necessary to liaise with Highways England (HE), Transport Scotland (TS), Transport for Wales (TfW) and other regional transport authorities so that major road closures do not coincide with major rail closures, particularly at the time of major sporting events. The general rule is to avoid major road closures on Bank Holidays (E-D-0918). Based upon feedback from TOCs, it was recommended that all franchise managers in DfT are clear about the objectives of the passenger handling plan and how it can be delivered for each franchise. They can be clear which decisions may need to be made and when, so the DfT does not inadvertently delay the planning process. It may be necessary to provide clear information on the purpose of the passenger handling initiative at a workshop so that franchise managers are able to give consistent answers when approached by TOCs for assistance (E-D-0918).

The objective of **access planning** is to negotiate the access window in which to deliver the work requested by the works deliverers.

The objective of possession planning and delivery is to coordinate all the key resources required to deliver the work. Standard 202 is used to guide which activities need to be undertaken to plan a standard possession and an assessment of worksite complexity will be carried out to identify if the Delivering Work Within a Possession (DWWP) standard should be applied. Activities carried out during the EAS to CPPP stage can be split into two main categories: access planning and possessions planning. There are key milestones in this planning process that are described in the Network Code and in Planning Standard 202.

The primary process used for planning is the NR/L2/OPS/202 (Issue: 7) Principles, Timescales and Functional Responsibilities for Engineering Work, Access and Heavy Resource Planning. This business process enables engineering access to Network Rail managed infrastructure to undertake inspection, maintenance, renewal, and enhancement of the network in compliance with the Network Code and with the objective of controlling the safety and business risks associated with arrangements for engineering access. It describes the key principles, activities, timescales, and associated work plan information necessary when planning the engineering access and resources. It includes the planning of engineering trains and on-track machines for maintenance, renewal and enhancement activity, but not the timetabling of these. It does not include the planning and timing of the Working Timetable (WTT) and amended train services for Network Rail's passenger and freight customers.

Delivery

Delivery of possessions requires significant coordination to ensure safety. The lowest level of Network Rail's safety hierarchy (Open Line or Red Zone, with no additional protection beyond human lookouts) has been associated with several safety incidents in recent years, including two tragic deaths at Margam in 2019. In a review of these incidents, the ORR concluded that Network Rail was not doing enough to control risks to track workers and issued two Worker Safety Improvement Notices. This requires Network Rail to eliminate unassisted Red Zone working as far as reasonably practicable by July 2022. The Safety Task Force was set up in response to fatalities on the rail network at Margam in 2019 and the subsequent ORR safety improvement notices[25].

There are two ways in which work can be carried out on sections of track. These are known as Green Zone and Red Zone (or Open Line) working, depending on the level of protection given to track workers in that location:

- **Green Zone working:** an area of protection for workers that separates work on the railway line from train movements. One way of arranging such a zone is to stop movements of all trains on lines at the location concerned[26]. Green Zone working includes line blockages and possessions
- **Red Zone working:** a site of work on or near the line where it has not been possible to set up a Green Zone[27]. The ORR has pushed the industry to eliminate unassisted Red Zone working entirely and reduce assisted Red Zone as much as possible. A small and decreasing proportion of work is being carried out in Red Zone working (E-C-0761).

Approximately 22% of Work Orders are carried out during possessions, along with around 30% in line blockages and 16% in unassisted Red Zone (16% could not be identified and 14% could be completed without protections as took place in offices or other safe areas) (E-D-0775). Network Rail's low usage of Open Line and adjacent line working has been identified in previous reports as a high relative cost for Network Rail (E-D-0075).

Work carried out in Red Zone must be non-intrusive, meaning that a train could pass through the work site without risk to the train. Work carried out in Green Zone can be non-intrusive or intrusive. In the context of this mandate, the elimination of the Red Zone working increases the demand for track access.

[25] Note: IN/TW/2019/07/08/1 and IN/TW/2019/07/08/2
[26] Retrieved from: Green Zone working | Safety Central (networkrail.co.uk)
[27] Retrieved from: Red Zone Working | Safety Central (networkrail.co.uk)

The primary process used in delivery is NR/L3/OPS/303 [Issue: 4] T3 Possession of the Line for Engineering Work Delivery Requirements. The purpose of this standard (in conjunction with GE/RT8000/T3 Possession of the line for engineering work and associated handbooks) is to inform Network Rail staff and contractors of the responsibilities and delivery requirements associated with delivering possession of the line for engineering work.

2.3.3 Assessment and findings

We sought to explore themes that impact efficiency in terms of process application including:

- Reworked, Short Notice and Cancelled Plans are leading indications of whether planning is efficient
- National resources are limited and finite, therefore a good indicator on whether planning is materialising into delivery
- Worksite per possession and lost work in possessions are leading indicators of whether delivery and access windows are maximised.

Theme 4: Changes to plans

An analysis (see Appendix E) illustrated the volume of changes with respect to when a possession is delivered[28]. We observed a high volume of changes to access plans, including cancellations, extended, curtailed and new possessions. The timing of these changes is important, as it applies minimum (or maximum) discount thresholds under the Schedule 4 mechanisms. As noted in the previous section, changes after T-7, seven weeks before delivery, were numerous despite changes at this time only being permissible if business or safety critical.

Changes to possession start times occur in two periods of activity in most Routes:

- Shortly before the T-37 PPS and NROL deadlines for booking disruptive possessions and heavy resources
- Near to delivery[29]. Most changes occur around the T-7 Late Change lockdown deadline.

Possessions that are created late (defined here after the PPS and NROL deadlines at T-37 weeks) are most notably Post EAS type possessions.

- Section 4 possessions are the most common type that make up a significant proportion of late-created possessions
- Section 5 possessions are in constant flux until the DPPP publication at T-26.

Routes displayed a pattern of increasing the proportion of cancellations per week in the weeks leading up to delivery. There are also two distinct periods of higher activity in cancellations:

- Near the T-37 PPS deadline and near delivery
- Cancellations around the publication of V2 and V4 of the EAS
- This frequency ranges from 17% to 22% of previously agreed possessions in all Routes except Wessex, where 15% of agreed possessions are cancelled before delivery
- Wessex cancelled the fewest possessions in total - just over 4% of all possessions in the week immediately preceding delivery
- In Wales & Western and North West & Central Regions, the T-Minus weeks with the highest number of cancellations were immediately preceding delivery and around T-6.
- The current lockdown of changes at seven weeks or closer to delivery appears to be ineffective. We can deduce this judging by the volume of changes that still occurs during that time. This indicates a distinct separation between development planning and delivery planning.

[28] Note: Due to there being set times of year when access is planned and the delivery of these works being spread out across the year, the analysis shows a distributed peak around T-37 weeks, rather than all changes happening just before 37 weeks out (the maximum discount deadline).
[29] Note: Southern Region's routes show a week-on-week increase all the way up to delivery, while other regions have most changes around the T-7 Late Change Lockdown deadline, and Wales & Western have an additional peak in activity shortly before the Informed Traveller deadline of T-12.

Cancellations are an indication of inefficiency, as any effort expended in planning is lost when the plan is not carried out. We sought to understand the evolution of planning and delivery and the reasons for the cancelled possessions. We note that:

- The PPS 'Reason for Cancellation' field has a pre-set list of options including 'Other[30]'
- The most common reason overall is 'Work linked to another possession'
- The next three most frequently used reasons are 'Cancelled by contractor', 'Cancelled by NR maintenance' and 'Cancelled by NR Delivery Planning Manager'
- Eastern, North West and Central and Wales & Western regions show broadly the same pattern of cancellation reasons, with most cancellations being due to 'Work linked to another possession' or cancellations by named parties
- In contrast, Scotland's most frequently used reason is 'Entered in error', and it also has the highest proportion of 'Dummy possession' cancellations
- The Southern Region have low proportions of 'Work linked to another possession' and high usage of the 'Other' category.

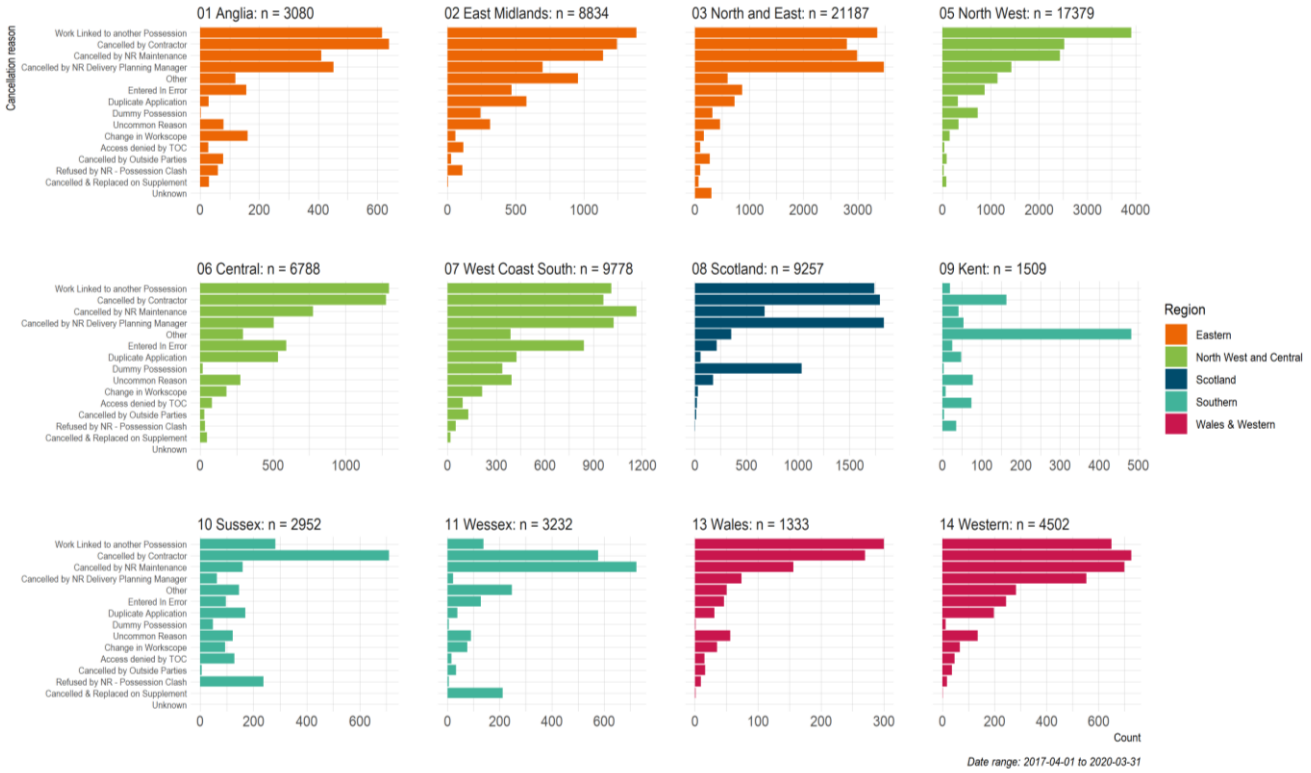


Figure 2.6 Reasons for cancelled possessions by Route (source: PPS)

Theme 5: Use of finite resources in delivery

Long disruptive possessions (covering entire weekends and weekdays either side) can be prohibitively expensive outside of bank holiday weekends. At locations where the network is particularly busy, many complex and large items of work requiring long possessions are therefore "pushed" into the bank holidays due to their relatively lower cost (E-D-0278). This limitation is exacerbated by the availability of critical heavy machinery and high output plant, which are limited in number and limits the overall volume of work delivery (E-C-0353).

The Network Rail Online Logistics (NROL) software is the primary booking and resource system for engineering trains. Some examples of the types of trains included in this system are On-Track Machine (OTM), Possession Train, Grinder and Seasonal Treatment.

[30] Note: Data quality may be an issue in the analysis of this data asset, as despite the long list of options, "Other" is used frequently, especially by some routes (it is by far the most frequently used reason in Kent, for example).

We observed three distinct areas that are impacting delivery related to:

- Critical resources
- Signallers' attention
- Worksites

Limited critical resources

The NROL database records the planned and actual arrival times of OTM (on-track machines), and possession trains booked to attend possessions. Route Services Supply Chain Operations is a functional unit within Network Rail responsible for the planning and delivery of 'heavy' resources (e.g. Kirov cranes, new measurement trains, mobile maintenance trains, tampers etc.), infrastructure monitoring and seasonal services. Key machinery is also sometimes leased by suppliers and there are 24 seasonal treatment fleet bases in Network Rail, from Scotland to the South East, and a dedicated plant maintenance centre.

Management and deployment of these resources both within Network Rail and the supply chain is key to executing on the Regions workbanks and in delivering possessions.

The late arrival of these resources at the possession can have a large impact on the ability of the worksites to carry out on schedule.

We noted that train bookings in NROL are linked to a specific shift, with event times monitored within the system. These event times include when the engineering train has both arrived and departed from the possession or worksite location. NROL also tracks version history with the number of changes made to a booking and the type of change recorded and stored. We note that:

- Delays of over 20 minutes occurred in 8.2% of trains planned to attend possessions
- The delay minutes vary across Routes, with Southern Region having the fewest minutes overall
- Small increases are observed in Wessex Route (3 minutes and 5 seconds) Sussex (3 minutes and 39 seconds), Kent (4 minutes and 46 seconds)
- Wales and Scotland see the highest variation month-on-month. However, we found that Scotland has the highest of all the Routes, at around 7 minutes and 49 seconds delay on average
- Southern Region are confident that they have flattened their resource demand well, using a swap system between Routes for heavy resources (E-C-0571).

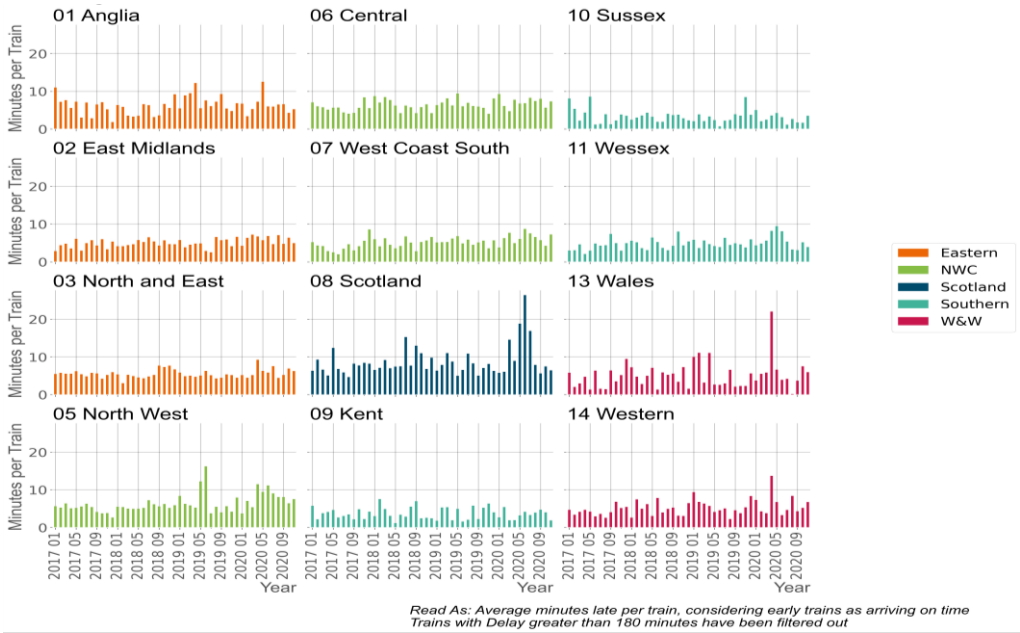


Figure 2.7 Average delay minutes per train scheduled for possession by Route (source: NROL)

Signallers' attention

Signallers are involved in the delivery of possessions in that the Person in Charge of Possession (PICOP) or equivalent role must communicate with the signaller to receive possession of the track for it to begin, and likewise must hand back the possession to the signaller for it to end.

In some critical areas, where multiple possessions may be starting or handing back in one signalling area at the same time, the signaller's time and attention can become the limiting factor to the timely start and end of the possession. We note that:

- With reforms in CP5 to consolidate signalling into large Rail Operating Centres (ROCs) covering large areas rather than a larger number of signalling boxes covering small geographic areas, the overall number of possessions per signaller has increased (E-C-0386)
- This problem is observed with non-intrusive line blockages, where there is a high demand for line blockages starting between 09:00 and 11:00 due to roster shift patterns.
- Where this demand is not managed, the total volume of work that can be accomplished is limited, not by the number of available maintenance staff or opportunities to access the track safely between trains, but by the fact that a single signaller can only accept the start and end of one line blockage at a time
- The Safety Task Force is directly addressing this uneven distribution of signaller demand through their planning workstream (E-C-0761).

Multiple worksites not exploited

A possession may have one or more work sites and each of these sites may have multiple sites of work where different activities are being carried out. Coordination is paramount to enable this to take place. Increasing the number of worksites, and therefore the volume of work[31],completed in a single possession is a straightforward way to minimise disruption to passengers and freight, and minimise costs due to Schedule 4 compensation payments.

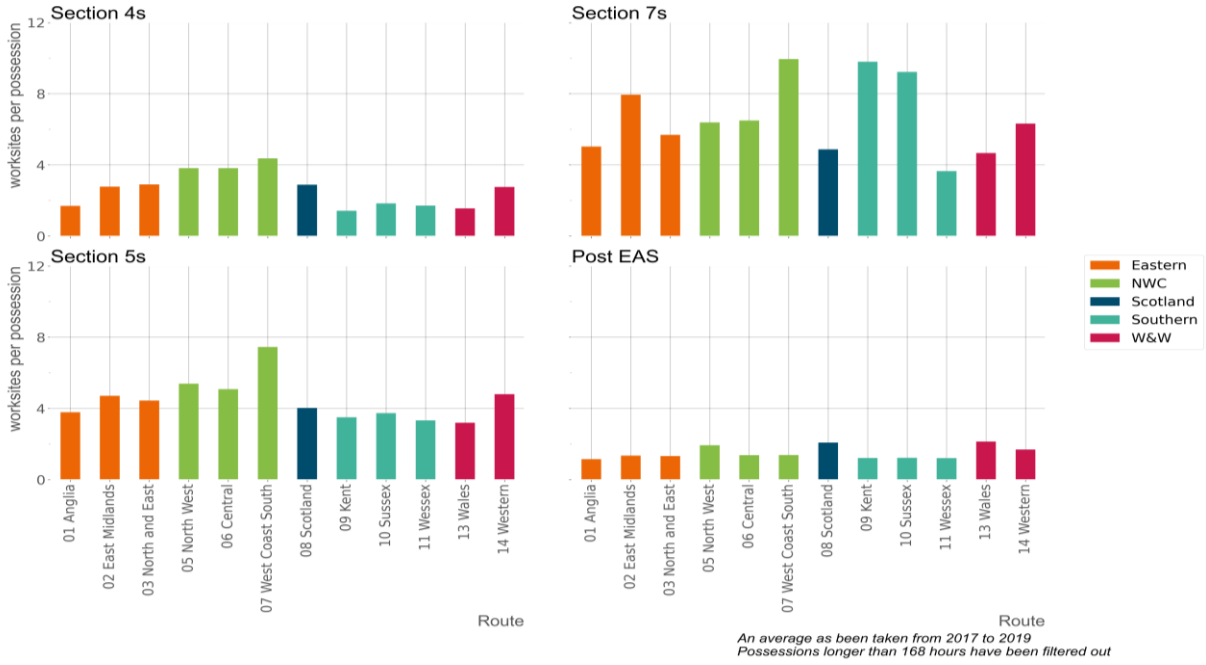


Figure 2.8 Average worksites per possession by Route per year (source: PPS)

[31] Note: We note that linking worksites to possessions in PPS is necessary for planning but in contrast to changes to possession records, has only an indirect effect on negotiations between Network Rail access planners and operators. The addition of multiple worksites to a possession does not affect nor disrupt the timetable. The time remaining until the delivery of a possession when a worksite is linked to it in PPS varies across routes.

We note that:

- Most possessions (54% of those in 2017/18 to 2019/20) have only one reported worksite
- North West & Central Region has some of the highest average worksites per possessions across all possession types
- Southern has relatively low worksite per possession in most types but high averages in Section 7 possessions. Consultees cited this as a success of their "Maximising Abnormals" initiative, which aims to increase the number of worksites in disruptive possessions lasting longer than 12 hours (E-C-0571). Their Section 4 and Section 5 possession are shorter than in most other regions due to long operational days, limiting the possible work activities that can be carried out. Likewise, shorter track lengths within a possession's protected area can make it impossible to add more worksites due to the smaller space.

It is noted that increasing the number of worksites per possession is not always possible (for example, where a possession covers a very small area). It can also have downsides, like increased safety or overrun risks due to managing a more complex work site, especially where multiple on-track machines or other heavy resources are used (E-C-0571). Nevertheless, the process of adding more worksites to an upcoming possession is a common aspect of planning, often referred to as adding "flesh to the bones" of the access plan. Wessex have implemented a Person in Charge of Possessions (PICOP) remote centre. This is a mobile solution for professionalising the role of a PICOP and pooling expertise under one roof. This allows the PICOPs to have the ability to view in real time, multiple possessions being undertaken with the use of common data and a shared workflow. A SharePoint (using PowerApps) platform allows this workflow data to be shared as events are taking place. Teams within the possession update various data points throughout the night shift including setup and hand-back times, work lost, overruns and incidents:

- It is explicitly stated as a benefit of several existing regional initiatives, including the One Plan in Wales & Western and HALO in North West & Central
- Fewer than 10% of worksites are planned or added to possessions plans before T-40
- Most Routes see peaks where most links are created, at T-37, T-12 and T-6 respectively the maximum notification discount deadline for PPS, the Informed Traveller deadline (as well as some regional planning deadlines) and near the late change lockdown deadline of T-7.

2.3.4 Conclusions

How efficient are Regions at planning and delivering possessions work taking into account the current industry framework surrounding possession planning?

We conclude that integrated planning plays a critical role in facilitated coordination so that stakeholders and plans are aligned, helping to minimise rework. All Regions and Routes consulted have set up, are in the process of setting up, or have plans to set up integrated planning teams. These teams focus solely on improving the efficiency of access planning in the following areas:

- Reducing operator challenges to the EAS
- Reducing Schedule 4 costs and therefore disruption to the passenger by optimising the amount of work delivered in a possession
- Improving on time performance of heavy resources in possessions.

Many factors can drive the need to re-work plans. We conclude that Team Scotland promoted a dynamic way of working with close collaboration between the Scotland Route in Network Rail, the Scottish Government, ScotRail (Scotland's main passenger operator), the ORR and the supply chain for Scotland's railway industry. This structure benefits from a vertically integrated railway, aimed to create alignment in processes, reducing overlaps and addressing gaps. (E-D-0536). Several stakeholders independently reported that this has resulted in significant improvements in the coordination and planning efficiency (E-C-0628), (E-C-0655). This reflects how late notice possessions provide flexibility where relationships with operators are strong, and where lockdown changes are managed in conjunction operators.

We note that the HALO team in North, West and Central displayed a deep understanding of core issues affecting the efficient delivery of possessions and have identified four key areas of focus in the early planning stage to minimise Schedule 4 costs, changes to access windows and overruns in deliver (E-D-0461). They claim that through closely measuring the savings produced through these activities North, West and Central have reported an estimated 24% reduction in possession hours from the initial hours requested and a saving of £45.7m in 2019 (E-D-0464). They also have reported a reduction in the number of comments against the Section 7 of the EAS from 1,649 in 2017 to 558 in 2019 (E-D-0730), (E-D-0730).

The teams place large emphasis on coordination between the many stakeholders involved. This included operators, asset management teams and works deliverers across large renewals and enhancements projects which require large volumes of disruptive access. Integrated planning plays a critical role in facilitated coordination so that stakeholders and plans are aligned. There is a need to further consolidate this type of culture with respect to late changes.

What is clear is that there is a separation between development planning and delivery planning, with a missed opportunity to rework medium - notice plans in the interceding weeks. This can be correlated with the low usage of the medium notification discount in the Schedule 4.

How efficient are Regions at planning and delivering possessions work taking into account the current industry framework surrounding possession delivery?

We note that the signaller's attention is a clear constraint in the handover and hand back process with possessions.

The Network Rail Online Logistics (NROL) database records the planned and actual arrival times of OTMs (on-track machines) and possession trains booked to attend possessions. The late arrival of these resources can have a large impact on the ability of the possession to carry out on schedule. Delays of over 20 minutes occurred in 8.2% of trains planned to attend possessions (E-C-0353).

The need to exploit worksite productivity is clear. Most Routes see peaks where most worksite links are created, at T-37, T-12 and T-6 respectively. This is where the maximum notification discount deadline for PPS, the Informed Traveller deadline (as well as some regional planning deadlines) and near the late change lockdown deadline of T-7 occur. This indicates a separation between development planning and delivery planning, with a missed opportunity and rework for "medium" notice plans in the interceding weeks.

2.4 KR 4: How Regions balance efficiency and contingency when planning and using possessions

2.4.1 Overview

A Quantitative Schedule Risk Assessment (QSRA), or recognised equivalent, must be undertaken by the sponsoring and deliverer organisation to test the operational risks to train services at all stages of planned engineering work.

There must be a clear understanding of the confidence that is in place for all aspects of the operational plan, and for contingency plans in the event of disruption. The Delivering Work Within Possession (DWWP) process and associated readiness reviews mandate this.

Risk is balanced through other intermediaries' processes, namely from the Routes' Timetable Change Advisory Group (TCAG) and associated Timetable Change Risk Advisory Group (TCRAG).

2.4.2 Application context

Contingency

The Delivering Work Within Possessions (DWWP) process was introduced following the overruns of major engineering works on the East Coast Mainline (ECML) and Great Western Mainline (GWML) during Christmas 2014. The process sets out guidelines on applying the level of contingency required in a possession. The level of contingency has a clear impact on efficiency of delivery as too much contingency will result in underutilisation of possession time and too little contingency may result in either an overrun or lost work. The DWWP therefore assesses all worksites to identify if there is a risk of a possession overrun - a high risk (red criteria) triggers a quantitative risk review of timelines, so that hand-back to signallers is not compromised and risk mitigations can be put in place. It is a wide set of guidelines[32] and does not account for locational variances. The primary process used for this is:

- DWWP is a Network Rail standard (NR/L3/INI/CP0064) and is mandatory for all projects working on the rail infrastructure
- Maintenance also has their own standard (NR/L3/MTC/MG0210) - Management of Maintenance Work Within a Worksite to Prevent a Possession Overrun.

Balance of risk

The Route, TOCs, FOCs and System Operator's Capacity Planning team must reach an agreement on the service specification, agreeing what the operators must bid at T-18 to satisfy passenger and freight demand within the available capacity. Risks and assumptions must be tested before the timetable is developed, so this work needs to be undertaken early enough in the access planning process to enable agreement to be reached alongside the EAS publication and tested for viability alongside capacity studies.

Evaluation can take place using several different methods, including studies on capacity and use of train operator's simulator tools. The robustness of timetable bids must be compliance checked alongside available capacity for both planned and contingency operations. Route Operations and the SO Capacity Planning teams must co-operate to gain an understanding of the safety and performance implications of any impact to signaller workload resulting from compromises in the developed timetable.

Risk of overrun is balanced through intermediaries including the Route Business Timetable Change Advisory Group (TCAG) and associated Timetable Change Risk Advisory Group (TCRAG) processes.

[32]Note: Delivering Work Within Possessions (DWWP) is a Network Rail (NR) standard (NR/L3/INI/CP0064) and is mandatory for all projects working on the rail infrastructure. Maintenance also has their own standard (NR/L3/MTC/MG0210) – Management of Maintenance Work Within a Worksite to Prevent a Possession Overrun.

These better inform the reviews of any additional issues or opportunities for improved operational readiness for the timetable change and engineering delivery.

Balance of efficiency

The Efficiency Improvement Programme sets out detailed plans to deliver on annual efficiencies. They identify two main possible sources of efficiency gains: saving money on contracts and delivering more volume for the same contract cost. The core emphasis of this initiative is assisting Network Rail's devolved Routes' business plans into practical actions with measurable efficiencies. The output of the initiative is a 'fishbone framework', which reconciles the baseline budget against the forecast budget and breaks down headwinds and tailwinds[33] that may affect each efficiency. Each Route is asked to report what they are currently spending in broad categories and expected sources of headwinds and tailwinds that may affect their spending. The summation of these factors culminates in a total saving across a period (E-C-0720).

2.4.3 Assessment and findings

Theme 6: Appropriateness of contingency

The level of contingency has a clear impact on efficiency of delivery as too much contingency will result in underutilisation of possession time and too little contingency may result in either an overrun or lost work. We note that:

- Specific measures are monitored followed by a review with lessons learnt and actions to drive improvements (E-D-0737). Data includes quantities, late change of red worksites and compliance of red worksites at T-4 weeks
- This is only done for holiday periods and not holistically. Clarity and appropriateness of the "level of contingency" used or applied therefore is not nationally analysed (E-C-0266), (E-C-0407)
- The DWWP process has driven down the frequency and impact of overruns. This is evident in the data from the Possession Overrun Information Capture (POIC) database (E-C-0597) (E-D-0603) (E-D-0760)
- The red site criteria and contingency time requirements are inflexible. This means that blanket application of the DWWP process can result in overly conservative works and underutilisation of possession time (E-D-0231)
- Contingency time on red site criteria is set at three hours or above (E-D-0231). We observed that there is a lack of consensus with respect to whether work can be conducted in float time or not (E-C-0633), (E-C-0634), (E-C-0655). The guideline rigidity and lack of how float time is used are key areas where opportunities are being missed
- Consultees cited that that float time is seen as highly rigid (E-C-0634) and bureaucratic. Stakeholders cited an example of the rigidity where a blanket float application is applied for a site once it is classed as a red site.

2.4.4 Conclusions

We acknowledge that a review is already planned with regards to the Delivering Work Within a Possession (DWWP). Clear understanding of the protocols related to what work can be delivered in contingency/float time is needed. This will ensure possession time is fully utilised and first and last trains of the timetable are not compromised. We also found that the data related time and usage of the contingency float is limited, inconsistent and not nationally analysed (E-C-0266), (E-C-0407). Balance therefore is not evident.

[33] Note: Headwinds being where there will be a negative effect on budget and tailwinds where an efficiency savings is proposed.

2.5 KR 5: How Network Rail uses and records information relating to possessions to inform decision making

2.5.1 Overview

The technology and digital architecture relating to planning and delivery records includes everything from national enterprise grade systems such as Possession Planning System (PPS) and Network Rail Online Logistics (NROL), to locally held spreadsheets for monitoring and analysis.

This landscape allows Network Rail stakeholders, from front line staff to senior management, to carry out day-to-day operational facilitation, coordination and data capture to assist with decisions that affect short, medium and long-term asset intervention plans.

As part of our review, we analysed the data contained within the PPS and NROL systems. This has revealed a range of insights that have shed light on some of the key variations in possessions planning between Routes.

By assigning an information management maturity score, we can highlight and draw out best practice to enable dissemination and implementation across the organisation. Scoring and assessment details can be found in Appendix D.

Table 2.2 Process monitoring maturity scoring levels and criteria (source: GHD)

Level	Description	Decision making	Information management	Data quality
1	Initial: Few measures for analysing efficiency	Tribal knowledge, gut-feel decisions, hierarchical structure	PDFs, unstructured data, word of mouth	Silos, scattered data, inconsistencies accepted
2	Managed: Basic management processes and controls established to track progress. Work units use some procedures that have proven to be efficient	Functional process orientation, data driven decisions, quality by inspection	Local, disparate spreadsheets	Recognition of inconsistencies but no management plan to address
3	Standardised: Proven measures to monitor and drive efficiency. Cross functionality understood.	Integrated processes, performance metrics, data driven decisions	Semi-manual data workflows	Some data cleansing at consumption in order to improve data quality
4	Advanced: Detailed measures of process and output quality. Processes managed, controlled and forecasted using quantitative techniques (and statistical algorithms)	Self-service dashboards and analytics, exception management	Automated data workflows	Data Quality KPI's and conformance visibility, cleansing at source

We found four measures that are being monitored to a greater and lesser extent across the organisation, from disparate PDFs and spreadsheets used to record compliance, to self-service dashboards driving day-to-day decision making. The measures are:

- Time in possessions
- Lost work in possessions
- Possessions overruns
- Late changes to plan.

2.5.2 Application context

The following systems are used to facilitate information management through the various processes:

Table 2.3 Information Systems (source: GHD)

System	Summary
Possession Planning System (PPS)	PPS is the core system behind possession planning and coordination. It contains a full record of all possessions that have been undertaken or that are planned, across all Routes. PPS allows users to update possession attributes. The system captures and records the full version history as users do this and stores this as a group of auditing tables at the backend of the software.
Network Rail Online Logistics (NROL)	The NROL software is the booking and resource system for engineering trains. Where applicable On-Track Machine (OTM) and Possession Trains are linked to a possession and worksite reference from PPS. We noted that train bookings in NROL are linked to a specific shift with event times monitored within the system. These event times include when the engineering train has both arrived and departed from the possession or worksite location. NROL also tracks version history with the number of changes made to a booking and the type of change recorded and stored. This change record includes a full record of cancellations.
Work Order Management Systems	Network Rail's data related to work-banks exists across multiple systems, but the primary system in use is Ellipse. This contains the work-banks for most disciplines, including track, signalling, drainage and electrical & power. Other work-banks exist within separate systems such as the Civils Asset Register and Reporting System (CARRS). JBA 065 is also used to maintain the earthworks inspection work-bank.
Green Zone Access Manager (GZAM)	GZAM is a web-based system for requesting and approving or rejecting line blockages for non-intrusive work on the track. GZAM has no features for assigning priority to requests, and no features to stop two incompatible requests from both being approved (beyond the approver's skill and knowledge).
Document Management Systems	Multiple stakeholders reported that Route and Region teams use systems such as Microsoft SharePoint to share documents with each other (E-C-0568), (E-C-0354), (E-C-0668). Document sharing systems such as this have the benefit of creating a central repository for easy access and collaboration with all relevant stakeholders.
Local analysis and information capture	In many cases across the organisation, stakeholders use locally held spreadsheets, PDFs and paper documents to conduct work, capture information, perform analysis, visualise data and monitor performance. Even where processes are similar across the organisation, tasks are being carried out in a localised way which makes it difficult to analyse captured data.

2.5.3 Assessment and findings

Theme 7: No unifying data architecture

There are several enterprise grade systems in Network Rail that are used during the planning and delivery of possessions. Many of these systems are nearing their End of Serviceable Life (EOSL) and so require upgrade or replacement (E-C-0314).

The IR found that the systems related to possession data tend to be limited in functionality, have poor user friendliness, and do not provide adequate integration with other priority systems in the digital estate (E-C-0346):

- The Possession Planning System (PPS) records circa 100,000 possessions per year and all its entries are made manually, as it has no upstream systems. (E-C-0346). The PPS database characterises different work types, in terms of inspections, maintenance, renewals or enhancements. Work disciplines, such as track, drainage or signalling, are carried out with possessions. PPS however does not capture information in a format conducive to optimising the wider planning process (E-C-0314)

- We note that this hampers efficiency improvements as process automation is limited and users spend time manually moving data/information through the process. A good example of this is GZAM (Green Zone Access Manager). We found that facilitation of the system takes up half of the efforts of a green zone access planner time just through its day-to-day housekeeping (E-C-654). It is noted that GZAM is being replaced
- We found that many of the systems use different location reference systems. Ellipse and other work management systems use Engineer's Line References and mileages in either yards or chains; possession planned in PPS use Lines of Route (LORs) as does the Weekly Operating Notice (WON); timetable planning in TPS uses timing point locations (TIPLOCs). This causes many issues and limits holistic data analysis that would enable insights driven decisions. An example of this is the lack of conflict detection articulated by the Access Planning Programme
- The lack of a unifying location referencing system means it is not practicable to analyse Ellipse work bank data with respects to possessions. This type of analysis could potentially yield significant insight into the detailed access requirements to deliver the planned maintenance regimes and reactive works.
- It is noted that Network Services and the APP place a high priority on the development on ensuring these systems can communicate. The APP aims to do this through a matching process.

Theme 8: Manual manipulation of information

Regional teams therefore go to great efforts to intertwine process with information. We found that many processes are still paper-based or involve manual or semi-manual processing of data and spreadsheets. This drives inefficiency from rework, errors and miscommunication. With regards to manual manipulation, we note that:

- PPS allows users to update possession attributes. The system captures and records the full version history as users do this
- Section 4 and Section 5 of the EAS are created manually externally to PPS, in Microsoft Word or Excel (E-C-0346)
- Comments against the EAS from internal Network Rail staff as well as operators come back as Excel spreadsheets, but also through phone calls and e-mails (E-C-305)
- Corrections and alterations to the EAS is paper based and time consuming for both Network Rail planners and operator staff alike (E-C-0799)
- Deconfliction between the access plan and the timetable is intensely manual, but still misses tens of thousands of conflicts each year - a significant safety risk which is only mitigated by large amounts of re-work being required on-the-day by operational staff (E-D-0458)
- Route teams use systems such as Microsoft SharePoint to share documents with each other (E-C-0568), (E-C-0354), (E-C-0668).

Theme 9: No uniform data presentation

What we found was that there is significant variation in the ways that the Routes monitor specific possessions planning and delivery performance measures. This makes it difficult to assess whether improvement is happening.

The scores below[34] reflect a qualitative assessment on the level to which Route teams gather, process, access and present possession data.

This assessment can be found in Appendix D.

[34] The following routes are grouped as they are managed together:
- East Midlands; North and East; and East Coast
- Kent; and Sussex
- North West; Central; West Coast South

Table 2.4 Assessment of data capture and processing scores (source: GHD)

Route	Time in possessions	Lost work in possessions	Possession overruns	Late changes to plan	Route Average
Anglia	2.33	2.33	3.00	2.67	2.58
Central Alliance	1.00	1.00	2.00	1.00	1.25
East Midlands; North and East; East Coast	1.67	1.00	3.67	3.00	2.33
Kent; Sussex	2.33	3.33	3.00	3.00	2.92
North West; Central; West Coast South	2.33	2.33	2.33	3.33	2.58
Scotland	2.33	2.33	2.33	2.67	2.42
Scotland Alliance	2.33	2.33	2.33	2.67	2.42
Southern Alliance	N	N	N	N	N
Wales	2.33	2.33	2.33	2.33	2.33
Wessex	3.33	3	3.00	3.00	3.08
Western	3.00	2.33	3.00	3.33	2.92
National Average	**2.30**	**2.23**	**2.70**	**2.70**	**2.48**

2.5.4 Conclusions

How Network Rail uses and records information relating to possessions to inform decision making?

Possession Planning System (PPS) PPS is the core system behind information that supports possession planning and coordination. It contains a full record of all possessions that have been undertaken or that are planned. We note that through the efforts of this review, no prior data analysis has previously taken place on the systems metadata (E-C-0431).

There is widespread resistance to changes to the Possession Planning System (PPS) despite it not having the ability to capture information in a format conducive to optimising the wider planning process (E-C-0314). The lack of a unifying location referencing system means it is not practicable to analyse Ellipse work bank data with respects to possessions. This type of analysis could potentially yield significant insight into the detailed access requirements to deliver the planned maintenance regimes and reactive works. This lack of a unifying data architecture also means that key systems are unable to communicate with each other which limits cross-functional analysis

Despite these challenges, Routes go to great efforts gather information that supports decision making across the four major themes cited above. Overrun's data is well managed and accessible in the POC database. Possession change data is in PPS which is relatively accessible. Time in possessions data and lost work in possessions data must be captured during the possessions and is often captured in spreadsheets and PDFs, making it difficult to process and therefore monitor in a meaningful way.

While manual processes cannot be eliminated, the large volume of manual work required at many steps of the EAS and worksite delivery is an immense source of inefficiency.

There is also no common and definitive set of Key Performance Indices (KPIs) related to possessions efficiency that are reported by the SO in terms of scorecards. Efficiency of possessions also has no formal definition.

There is significant variation in the ways that the routes monitor specific possessions information that drives decision making.

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2.6 Recommendations

2.6.1 Late change review

We conclude that there is a high volume of changes to access plans, including cancellations as well as extended, curtailed, and new possessions. The timing of these changes ensures that the plans associated with them have only the minimum discount under the Schedule 4 mechanism. This increases compensation costs for Network Rail in the event of disruption. The EAS lockdown of changes at seven weeks or closer to delivery appears to be ineffective - the peak of changes occurred at T-7 despite changes at this time only being permissible where they are business or safety critical.

We recommend that Network Rail conduct an in-depth analysis of what root-causes facilitate late changes and whether those changes are good or bad with respect to efficiency and stakeholder requirements / whole industry value. Actions include:

- Late change survey to conduct an in-depth analysis of what causes late changes
- Consolidation of governance under one national programme such as the APP
- PPS updated to enable categorisation of changes based on this review. Changes should include variations to start or finish time of possession, cancellation of possessions or late creation of possessions.

We also recommend a survey of current manual processing activities to understand the extent of the manual processing of data and information in Network Rail. The survey should identify the amount of time spent by individuals:

  – Manipulating spreadsheets
  – Performing day-to-day tasks that are regularly repeated
  – Looking for information or data
  – Dealing with errors, repeating work, performing work that has been performed by someone else.

This would provide senior management with a better idea of the waste, inefficiency and risk that this issue poses to the business and would provide evidence to back up any business cases to automate these tasks where possible.

Recommendation P1	Conduct in-depth survey and analysis of (i) the causes of late changes and their impact on possessions efficiency; and (ii) the manual approaches to processing possessions data and information. Root-cause understanding of these two areas could significantly improve efficiency.		
	Ease	**Impact**	**Owner**
	Medium	Medium	Access Planning Programme, Intelligent Infrastructure

2.6.3 Benefits realisation

Integrated planning

We recommend that a team is mobilised and dedicated to integrated, long-term possession planning in each Route. These teams must extend to the Engineering and Asset Management team to ensure integrated planning at the work bank specification stage of the planning process.

Best practice integration of access and work plans should be identified across the processes already in place by the various Routes. These processes should be enhanced by clear line-of-sight, training for access planners, and planning tools to enable effective and efficient access plans to be built. The creation of these regionally based planning teams will allow for devolved decision-making taking place close to the impacted areas. However, it must be balanced with the existence of a central 'guiding mind' for controlling nationally limited resources and for sharing lessons learned from regional teams to equivalents in other areas.

Recommendation P2 Establish a dedicated long-term integrated possession planning team in each Route to promote devolved decision-making close to the impacted area and improve access planning and delivery efficiency.

Ease	Impact	Owner
Medium	Medium	Access Planning Programme

Use of contingency reasoning

We recommend a full DWWP review takes place to better integrate the guidelines surrounding the use of contingency time into the wider system architecture.

Actions include:

- Assess the communication and guidelines surrounding the use of contingency time to ensure clearer understanding throughout Network Rail. This will enable better use of contingency time to deliver work in possessions and drive improvements in efficiency. Further, gather and analyse data surrounding the use of contingency time to ensure contingency levels are appropriate.
- This should integrate protocol accountabilities with PICOPs and signallers.
- Given the lack of easily accessible data surrounding contingency time (noting that ODM reports do contain this information but that it is of low consistency), add data to the "Time Recording" workstream of the Intelligent Infrastructure Planning programme.

The outcome should be to achieve a demonstrably consistent NR-wide understanding of the meaning of the contingency time guidelines and to establish effective monitoring of contingency time utilisation across the business. This is an internal NR exercise consisting of a communication and training programme, with a monitoring process stewarded centrally.

Recommendation P3 Undertake a full DWWP review to better integrate the guidelines surrounding the use of contingency time into wider systems. This should establish use of contingency within possession and integrate protocol with PICOPs and signallers.

Ease	Impact	Owner
Medium	Medium	Access Planning Programme

Possession's performance metrics

At a national level and through engagement with the Routes, clear measures should be defined against the elements of the planning and delivery process that are identified as the largest drivers of inefficiency. The sources of data that inform these measures should be identified and efficient, centralised, data processing workflows be implemented to enable easy access of data by the Route to monitor the measures and drive improvements.

We recommend that key efficiency measures for possession planning delivery efficiency are defined and implemented. There are a number of measures that would greatly enhance Network Rail's understanding of efficiency and its ability to drive improvements. A definitive set of measures should be developed and integrated into the System Operator scorecard structures. Actions include:

- Agreement with the ORR that link into other regulatory measures
- The Regions and Routes should then design and build their own performance monitoring dashboards to ensure they have control and can design the dashboard to meet the specific requirements of the Route
- The outcome should be to achieve a detailed understanding of the drivers of inefficiency in the possession planning process and to put in place the ability to explicitly measure them to ensure the business is able to drive improvements.

Recommendation P4	Implement a definitive set of KPI measures that integrate the System Operator scorecard structure tiers 1 -3 that focus on possession productivity and efficiency.		
	Ease	**Impact**	**Owner**
	Easy	High	System Operator

2.6.4 Data and digitisation

Digitalisation of information workflows

Studies have shown that up to 25% of resource time can be spent in search of information in organisations with substandard information management[35] and that organisations with a data driven analytics culture financially outperform their competitors[36] and achieve their business goals[37]. Whilst a data management and monitoring maturity score is not a definitive measure of Route performance, it is a useful indicator. The maturity of the Routes' monitoring of specific process measures, with respect to information, data management and communication, is key factor in determining how they use and record information to inform decisions.

We conclude that there is a significant opportunity to digitalise possessions information currently being disseminated throughout Network Rail to significantly improve the efficiency of the access planning process. This includes the EAS, an Open Source digital diary, Rules of the Resource and lessons learned. Actions include:

- All non-mandatory access planning rules and guidelines be captured digitally. This could include:
  - A digital diary that all stakeholders, including Network Rail, operators, supply chain, other transport agencies and local authorities can access to optimise the access windows
  - Digitalised lessons learnt or ways of working that enable easy reference during access determination
- Consolidation of governance under one national programme such as the APP

[35] Note: "The Real Cost of Asset Information: How Better Costs Less", Ruth Wallsgrove, Sarras, '03
[36] Retrieved from: Data-driven companies outperform peers financially, reveals Tableau-sponsored Economist Intelligence Unit survey
[37] Retrieved from: Insight-driven organization | Deloitte Insights

- The EAS is captured, edited and communicated digitally, and that all access planning rules and guidelines be captured and communicated digitally
- All Routes engage with their operators to supply Rules of the Resource documents that dictate when operators do not want access to be disrupted. This would significantly improve communications between Routes and operators and enable more effective and efficient planning of access.

The outcome should be to increase the speed and reliability of the EAS negotiation process and ensure that all access planners have the same information available to them to carry out their roles.

Recommendation P5	Digitise the EAS tools of the possession planning process and formalise changes of the EAS.		
	Ease	**Impact**	**Owner**
	Easy	Low	Access Planning Programme

PPS and NROL data accessibility

There are multiple avenues for further data exploration exist for expanding upon the work presented here. These can be split broadly into analysis on existing data accessibility, and analysis of characterisation.

We recommend that accessibility to data in Possession Planning System (PPS) and Network Rail Online Logistics (NROL) is significantly improved to enable efficient day-to-day operations and consistent and efficient performance monitoring. These can be split broadly into analysis possible on the existing and already accessible data sources and analysis which could easily become available given an effort to bring together currently disparate data sources. Actions include:

- Characterise a centralised “data lake” that is accessible by Business Intelligence (BI) tools such as Power BI
- NROL characterisation variations in arrival time of booked trains to worksites (rather than possessions), especially on complex possessions with high numbers of worksites and attending trains. The distribution of trains per worksite, trains per possession and trains attending multiple worksites in one shift can help understanding about how engineering trains are used within possessions and where problems relating to late arrival most often arise or create the greatest knock-on delays.
- PPS characterisation on how different work types, in terms of inspections, maintenance, renewals or enhancements, and work disciplines, such as track, drainage or signalling are carried out within possessions. Some types or work may be carried out in mostly shorter possessions, for example, or may be linked to possessions only later in the planning process. This would allow for a fuller understanding of how works deliverers — and access planners which prioritise the work deliverer's requests — impact the planning and delivery process.

Other data sets, such as the detailed records of each Schedule 4 compensation payment made by Network Rail to operators can also be explored further. In particular, a detailed analysis into which factors have the highest influence on the total compensation payment could be key to driving down total compensation costs, especially when combined with an estimator tool to simplify planning decisions.

Recommendation P6	Characterise the Possession Planning System (PPS) and Network Rail Online Logistics (NROL) and centralise a “data lake” that is accessible by BI tools.		
	Ease	**Impact**	**Owner**
	Easy	Low	Access Planning Programme

Enabling Delivery through the National Framework

3. Enabling Delivery through the National Framework

3.1 Introduction

Section 3 considers the mandate related to whether the framework enables Network Rail to best deliver for the passengers and funders. Structured in a similar way to Section 2, it directly addresses the remaining key requirements 2, 6 and 7 from the study mandate.

The governance regarding capacity, access and timetabling are fundamental activities that control how the railway is operated. When asset interventions are needed, access (when intervention is needed on a “closed” railway) and timetable accommodations (when intervention is needed on an “open” railway) are fundamental. It impacts or interfaces with virtually every operational stakeholder and customer across the rail industry. Commercial friction is prevalent, and we explore the extent of disputes and compensation and whether it is enabling the industry to best deliver. Fundamental to achieving consensus with the operators is the Network Code. The Access Planning Framework facilitates the sometimes-conflicting activities in Part D of the Code (the decision rights) where the hierarchy of needs between Network Rail and the operators is settled. In short, the need for the train service versus the need for engineering access.

We observed that in an average year, Network Rail plans and executes 100,000 possessions annually and along with its supply chain undertakes circa 700,000 man-hours per annum within protection measures.

We provide context of the National Framework at the start of each section to inform the reader of this complex commercial relationship. Our assessment and findings are articulated at the end of each section and are based on evidence and objective assessment. At the conclusion of the section, we make practical and smart recommendations along with subsequent actions.

3.2 KR 2: Is there a clear line of sight from Network Rail's Activity Based Planning and Strategic Business Plans to possessions?

3.2.1 Overview

Strategic Business Plans (SBPs) set out Network Rail's strategies for operating, maintaining and renewing the network, along with how it intends to improve its capability and efficiency. These plans will affect what the railway can deliver - and have a significant impact on the service that train operators can offer to passengers and freight customers - as well as the future condition of the network.

3.2.2 Enablement context

Governance

SBPs were developed in advance of the current Control Period as part of the CP6 delivery plan. This includes specific plans for Network Rail's key functions (such as the System Operator). SBPs were agreed under the former organisational structure, detailing goals related to improvements in safety, train performance and financial efficiency, as well as upcoming asset interventions. Each Route, the Freight and National Passenger Operator (FNPO) and the SO have all developed SBPs.

Network Rail's SBPs consist of a suite of tiered strategies:

- Tier 0: three published summary documents for Great Britain, England & Wales, and Scotland
- Tier 1: the strategic plans, consisting of several documents:
  - A strategic plan for each Route including the FNPO
  - A strategic plan for the SO
  - A strategic plan(s) covering all the central functions
  - Inputs to the strategic plans, prepared by central functions, in the form of planning assumptions and short form strategies
- Tier 2: detailed strategies that underpin the strategic plans - for example, the sustainable development strategy.

ORR regulates Network Rail's SO activity separately, implementing regulation that is tailored to support improved timetabling, better use of the existing network, and analysis of how the network should be enhanced over time.

Asset intervention plans adopt the hierarchy developed by Activity Based Planning (ABP). Maintenance plans adopt the structure developed by this ABP. During the Control Period Planning, the asset interventions and business improvement activities required to meet the organisation's objectives for the upcoming 5 years are determined, costed, and prioritised. With respect to possession planning and delivery, there are two main outputs from this process: definition of the high-level asset renewals and work-banks. Note that enhancements aren't part of the regulated business plan submission and are now governed by the Rail Network Enhancements Pipeline[38] (RNEP).

[38] Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/953967/rail-network-enhancements-pipeline-document.pdf

Volumes are generally calculated using lifecycle models that determine remaining asset lives based on condition assessments conducted by MDUs, as well as remote condition monitoring technology, asset performance and reliability (E-C-0743), (E-C-0798). Once this costed plan has been determined, the Route Asset Management Plans and Route Strategic Business Plans are developed, and funding is secured. In these plans, commitments are made with respect to:

- Maintenance and reactive work volumes
- Renewals and enhancements projects
- Implementation of initiatives.

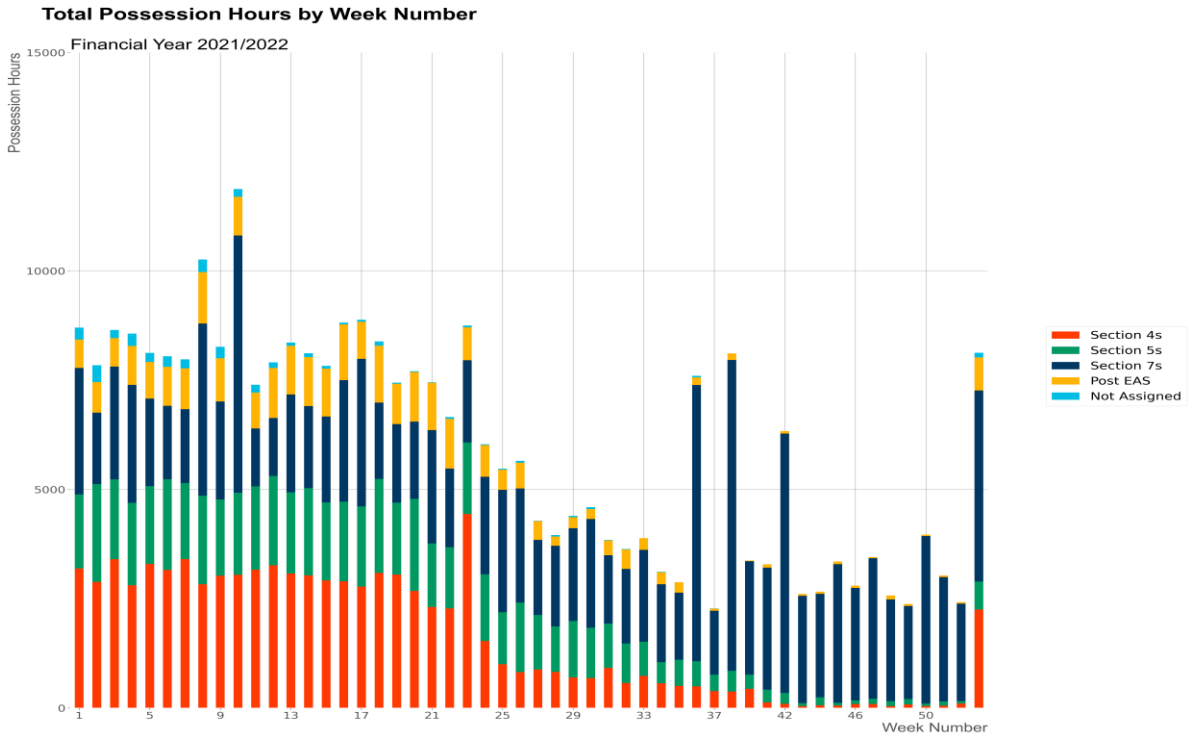

Figure 3.1 Planning - annual look ahead FY21/22 (Source: PPS)

Efficiencies realisation

The Efficiency Improvement Programme (CIP) sets out detailed plans to deliver on annual efficiencies. They identify two main sources of efficiency gains: saving money on contracts and delivering more volume for the same contract cost. The core emphasis of this initiative is helping Network Rail's devolved Routes' business plans become practical actions with measurable efficiencies. The output of the initiative is the fishbone framework, which reconciles the baseline budget against the forecast budget and breaks down headwinds and tailwinds[39] that may affect each efficiency.

Activity based planning

Activity Based Planning (ABP) estimates for Maintenance Delivery Unit (MDU), resource requirements using the maintenance volume requirements by Standard Job (SJs) and the average hours that a specific MDU requires to carry out that job.

SJs include the Maintenance Scheduled Tasks (MSTs), which repeat cyclically, and an estimate of the future burden of reactive work. This estimate is based on historic averages, local knowledge of upcoming renewals, and other factors that can influence asset reliability.

[39] Note: Headwinds being where there will be a negative effect on budget and tailwinds where an efficiency savings is proposed.

3.2.3 Assessment and findings

Theme 10: Track activities line of sight

There is a relatively mature and controlled process to feedback to the asset management teams on whether critical renewals have been completed and where works have not been delivered (E-C-0406). We note that:

- Large asset interventions are communicated through Route Asset Management (RAMs) plans to work deliverers. We found that there is an increased effort in the control period by teams to communicate the work-bank early to the supply chain to ensure deliverability (E-C-0607)
- Each Route is asked to report what they are spending in broad categories and expected sources of headwinds and tailwinds that may affect their spending. The summation of these factors culminates in a total saving across a period (E-C-0720)
- Efficiency gains include quantified gains from improved possession planning in several SBPs (E-D-0112 - E-D-0138). These are rarely accompanied by KPIs or detailed plans on how to accomplish these gains in terms of the mandate
- The resulting line of sight within disciplines from Control Period Planning (CPP) through to delivery appears to be relatively robust.

Theme 11: Maintenance activities line of sight

With respect to maintenance volumes, we noted that the Activity Based Planning (ABP) tool has enabled significant improvements in the line of sight of maintenance volumes and subsequent resource requirements.

- We found that the average hours to deliver each Standard Jobs (SJ) are calculated using historic Ellipse data. The estimated hours to deliver a SJ are specific to that MDU. These hours (called norm hours) vary due to differences in terrain, scarcity of access points, and differences in asset complexity, age or model. (E-C-0568)
- Prior to each year, MDUs adjust the maintenance volume forecast based on inspections that have been conducted throughout the year. This forecast then advises the level of resource required for the year and feeds into the National Readiness reporting (E-C-0568)
- Activity Based Planning MDU hours are used to understand productivity and drive improvement initiatives specifically around Time on Tools to reduce the norm hours. Time on Tools improvement targets are mentioned in several Route Strategic Business Plans. (E-C-0568)
- We noted that there is a project in place to measure planned resource and maintenance volumes against actuals. This is under way and due to be rolled out in 2021 (E-C-0568).

Theme 12: Use of digital technology

Several Routes are developing Business Intelligence platforms and dashboards to enable more effective and efficient planning. The dashboards enable rapid collation of works into groups that can be delivered together in a single possession, as well as clear line of sight regarding what plans are being developed.

The One Plan that has been developed in Wales & Western is a clear example of best practice in this area, driving reductions in duplication and rework in the planning process through (E-C-0407), (E-D-0510):

- Reducing the need to combine several spreadsheets into one larger spreadsheet
- Avoiding versioning issues and enabling real-time updates
- Easily and quickly communicating the plan to all stakeholders, enabling rapid and effective collection of information.

North West & Central are developing a similar dashboard called EARRS (Engineering Access Requests & Reporting System), which aims to also incorporate the supply chain, path planning and Schedule 4 estimation calculations to optimise the early planning process (E-D-0463).

Wessex have implemented the Wessex Integrated Planning Portal (WIPP), a SharePoint / PowerApps platform which allows data to be shared with stakeholders (e.g., control centre) as events are taking place. It also acts as a repository for documents with an associated workflow on the processes Wessex have put in place. The WIPP enables multiple teams to stay updated on the status of work throughout a nightshift or possession without the need for multiple phone calls, emails and duplication. Data is also captured in one single system related to the Route, enabling users to find information easily and export the data for analysis without combining multiple datasets. Access to the system is controlled within the team, so that edit/read only permissions are allocated to roles appropriately. This aids the assurance of the data alongside version history.

Using dashboards to categorise and communicate possession planning data results in a significant reduction of duplication, errors and rework. The Routes and Regions are proving that it is possible to leverage efficiency through technology, but they are currently focussing on disruptive possessions. There are significant efficiency gains to be made through the use of technology to optimise the delivery of reactive and planned maintenance work.

Theme 13: Booked possessions

The National Readiness team monitor several key metrics for each Route to understand whether that Route is ready for the upcoming year (E-D-0434). These are:

- Disruptive access: monitors the hours of disruptive access booked relative to expected hours needed, based on previous years (adjusted for fluctuations)
- Work-bank planning which monitors three measures:
  - The total cost of financial authorised renewals relative to previous years (adjusted for fluctuations)
  - The volume of renewals remits used and accepted by works deliverers
  - Work-bank stability measured by looking at changes to financial requirements
- Maintenance headcount: measures the maintenance resources required against those available.

3.2.4 Conclusion

Is there a clear line of sight from Network Rail's Activity Based Planning and Strategic Business Plans to possessions?

We can conclude that there is a clear and facilitated line of sight between Strategic Business Plans (SBPs) and Activity Based Planning (ABP) with regards to maintenance and track renewals. Possessions across sampled Regions are booked in accordance with these planning-based strategies.

3.3 KR 6: Are Network Rail's possession efficiency initiatives embedded and best practice shared?

3.3.1 Overview

It is important to understand the trajectory of planning and delivery initiatives and how they are seeking to make a material impact on the efficiency of possessions. New technologies are being sought by Network Rail and innovative ways of working are being implemented across the industry. This includes technologies to increase the speed of work on and off the track. In this section, we identify national and regional initiatives underway within Network Rail and consider the extent of the reach in respect of wider communication and knowledge sharing.

3.3.2 Enablement context

Governance

Network Services was created as a direct response to Network Rail's Putting Passengers First programme (PPF) in June 2019. It provides network operational, freight, telecoms, and technical expertise, as well as the co-ordination of national programmes and initiatives that help the regions deliver for passengers and freight users, such as incident management, security and performance.

During our review, we noted that Network Services is undergoing a restructure and that major programmes such as the Intelligent Infrastructure (II), Group Transformation among others will be moving to Route Services. This is still to be determined.

There are several nationwide improvement initiatives relating to possession planning and delivery. We see a considerable opportunity for Network Rail to better communicate and coordinate between these initiatives, to ensure they are working together to maximise the pace and impact of benefits. Technology implementation is central to unlocking many of these benefits. We identified the following within the governance structures:

- **Infrastructure Access & Possession Delivery Strategy Board.** This is a governance panel set up to monitor, communicate, coordinate and regulate improvement initiatives that affect possessions planning and delivery. We note that this board was set up in the 8 months (E-C-0800) preceding the review
- **Planning and Access Steering Committee.** The purpose of the committee is to provide clarity and alignment of the different programmes which fall under the Planning & Access programme portfolio. It aims to unify understanding of the improvement programmes that impact planning and access, align the goals and objectives of those programmes, and provide a clear vision that is endorsed by Network Rail. This will drive improved benefits realisation from programmes (E-D-0264)
- **Centre of Excellence (CoE).** The Centre of Excellence (CoE) supports and provides leadership for project and programme management in the Routes and Regions. It does this by guiding and enabling through the provision of governance and capability improvement frameworks and by reviewing and assuring. The CoE protects Network Rail's interests and gives confidence to the Board and external stakeholders (E-D-0741). It is accountable for:
  - Governance, frameworks, and policies for capital delivery
  - Professional leadership for capital delivery (P3M), sponsorship, risk, controls, and cost planning)
  - Second line national portfolio assurance for capital delivery including affordability and deliverability
  - Assurance of network wide enhancements portfolio.

Initiatives related to sharing of best practice fall into national programmes and regional initiatives.

National improvement programmes

Table 3.1 Summary of National programmes (source: GHD)

National Initiatives	Summary
Efficiency Improvement Programme (EIP)	Sets out detailed plans to deliver on annual efficiencies. They identify two main possible sources of efficiency gains: saving money on contracts and delivering more volume for the same contract cost. The core emphasis of this initiative is to assist Network Rail's devolved Routes' business plans into practical actions with measurable efficiencies. The output of the initiative is a fishbone framework, which reconciles the baseline budget against the forecast budget and breaks down headwinds and tailwinds that may affect each efficiency. The Routes are given autonomy to identify their own efficiency mechanisms and articulate expected benefits.
Access Planning Programme (APP)	The objective of which is to give significantly improved visibility of possessions to train planners to prevent scheduling conflicts. A core part of the changes required are to culture, people, and processes, and not merely to technologies and systems (E-C-0314)..
Governance, Risk, Assurance, and Improvement (GRAI)	The aim of Project GRAI is to bring together all possession planning governance, risk, assurance and improvement activities processes, and improve the level of performance of a suite of high-level Network Rail business process areas. A high priority for GRAI is the effectiveness of Network Rail Possession Planning and Possession Delivery Processes. There are 16 high level business processes within scope, each with up to 60 sub-processes. GRAI aims to develop a suite of process monitoring dashboards so that performance by Route or region can be assessed in real time.
Intelligent Infrastructure (II)	II planning is a stream within the wider Intelligent Infrastructure programme. It has three (3) areas (E-D-0397): – Asset Lifecycle Planning: to enable optimised strategic possession planning. – Work Planning Scheduling: to enable optimised scheduling of maintenance and reactive work. – Time Recording: to capture and understand the use of time in possessions. To date, the programme has engaged relevant stakeholders to understand requirements, scoped the problem and solution and detailed the interacting systems and processes. The II Early estimates for the cost and benefits in CP6 of this programme are £21.8m and £71.6m respectively, with benefits expected to be realised from mid-2022 (E-D-0398). The key issues they are aiming to solve are (E-D-0397): – Address the lack of simple tools to communicate and plan possessions that optimise access. – Limit inefficiency involved with errors and rework in planning. – Reduce access conflicts between infrastructure and maintenance projects. – Reduce the effort and waste involved in the processes for capturing front line time usage data and improve decision making surrounding possessions performance.
Project Speed and PACE	Project Speed includes a workstream rolling out PACE (Project Acceleration in a Controlled Environment). This workstream has identified GRIP (Governance for Railway Investment Projects) to be mis-aligned with the Engineering Access Statement timelines and is seeking to address this (E-D-0541). The process is due to commence roll-out in early January 2021 (E-D-0541) with potential benefits listed as: – Increased flexibility of discount options in the early lifecycle of the project timeline, reducing time and cost associated development – Delegated authority to encourage agility and innovation in the project development – Alignment with the Engineering Access Statement timelines.

National Initiatives	Summary
The Safety Task Force Programme	The Safety Task Force was set up in response to fatalities on the rail network at Margam in 2019 and the subsequent ORR safety improvement notices. Its objectives are to eliminate unassisted Red Zone or Open Line working (which rely on human lookouts for warning) and to reduce line blockages without additional protection by 2022. The programme has identified several measures of compliance that it is targeting in every Route (E-D-0775): – Minimising the volume of work delivered on track by optimising and aligning work-banks – Identifying and allocating access windows – Risk ranking the access availability and eliminating unassisted Open Line working. Planning for Delivery, a workstream within the programme, has procured two new technologies to replace GZAM and SSOWPS (Safe System of Work Pack System). The first is the Line Blockage Planning System, which will enable more integrated and efficient line blockage booking based on signaller and line section availability, a feature not available in GZAM. The second is Rail Hub that will ensure personnel on track have the relevant competencies, clearly identify whether personnel are on the track or not, and whether they are using the correct access points to get onto the track (E-C-0761). This workstream is funded (£16m) with trials to start in May 2021 (E-C-0761).

Regional initiatives

Regions are coordinating numerous initiatives into Route businesses in order to make more productive use of engineering access, including longer midweek night possessions, identifying regular access opportunities in key locations and better packaging of work to allow more to be done within a possession. We summarise these below.

Table 3.2 Summary of regional initiatives (source: GHD)

Region / Route	Initiative	Summary
1. Eastern	**Diamond Model**	The diamond model identifies target possessions where the unit rate is low, with the goal to identify more work which can be delivered within the time and resources available (E-C-0341). No documentation was observed for this initiative.
2. North West & Central	**Halo Team**[40]	Originally the “HS2 Access and Logistics Organisation” but has grown in scope to include integrated planning of access and logistics for all of North West & Central region. The HALO team works closely with operators and suppliers on planning disruptive access 2-5 years ahead. This has resulted in a significant reduction in challenges to EAS Version 1 and savings of Schedule 4 payments.
	Engineering Access Requests & Reporting Systems (EARRS)	A central database (currently in-development) designed to be the “one source of truth” with full visibility to Regional, Route, project and operator staff of all disruptive access plans. It is intended to reduce duplication and the simplify the way that access requests are made (E-D-0463).
3. Wales & Western	**One Plan**	One Plan uses a live Power BI dashboard to display both access opportunities and work-banks in one place with full visibility, enabling more efficient and effective planning of possessions. This has enabled the collation of work that would otherwise have been delivered over the course of the control period due to the degradation forecast. This enables a significant reduction in overall access required (E-D-0510).
	Live Worksite Reporting	Real-time data collection using a mobile app enabling a live dashboard progress at possession with high durations and complexity. This enables a significant reduction in communication required between Person in Charge of Possession (PICOPs) and other stakeholders as all the information is in one place. Additionally,

[40] Note:

Region / Route	Initiative	Summary
		progress against the plan can be monitored to assess overrun risk. A future aspiration for this dashboard is to roll it out to the majority of possessions to enable monitoring of time in possessions to drive continuous improvement of possession efficiency (E-D-0509).
4. Scotland	**Team Scotland**	Promotes dynamic ways of working and close collaboration between Scotland Route in Network Rail, the Scottish Government, ScotRail (Scotland's main passenger operator), the ORR and the supply chain for Scotland's railway industry. This structure has some of the benefits of a vertically integrated railway, aiming to create alignment in processes, reducing overlaps and addressing gaps. (E-D-0536).
	Industry Planning Office	Focused on integrated planning of all infrastructure work, with a strategic view in light of timetable planning and rolling stock deployment. It is designed to be a single data source for decision making and includes workstreams for an Integrated Planning Tool and Visualisation Tool, among others. (E-D-0550).
	Project Hannibal	Project Hannibal has two main elements: to define and implement an integrated planning strategy for Scotland's Railway; and to bring together all parties to work collaboratively to remove the frustrations and improve the outputs from the day-to-day planning processes. Several stakeholders independently reported that this has resulted in significant improvements in the coordination and planning efficiency (E-C-0628), (E-C-0655), although no data driven evidence of improvements was observed.
5. Southern	**Person in Charge of Possessions (PICOP) remote centres**	The Wessex Route and its supply chain have implemented a remote, Person in Charge of Possessions (PICOP) centre/s. Wessex views this as professionalising the role of a PICOP and pooling expertise under one roof. This allows the PICOPs to have the ability to view in real time, multiple possessions being undertaken with the use of common data and a shared workflow. A SharePoint (using PowerApps) platform allows this workflow data to be shared as events are taking place. Teams within the possession update various data points throughout the night shift including setup and hand-back times, work lost, overruns and incidents.
	Wessex Integrated Planning Portal (WIPP)	The SharePoint / PowerApps platform allows data to be shared with stakeholders (e.g., Control Centre) as events are taking place, as well as acting as a repository for documents with an associated workflow on the processes Wessex has put in place. This enables multiple teams to stay updated on the status of work throughout a nightshift or possession without the need for multiple phone calls, emails and duplication. Data is also captured in one single system related to the Route, so users can find information easily, as well as export the data for analysis without combining multiple datasets. Access to the system is controlled within the team, so that edit/read only permissions are allocated to roles appropriately.
	PossessionView and PossessionView Live Monitoring	PossessionView is hosted on the Wessex Integrated Planning Portal SharePoint Online site. It uses PowerApps to create dynamic forms and monitoring screens such as the PossessionView Live Monitoring screen.
	Access Change Matrix	Change control processes have been agreed and stood up with planning stakeholders across the Route. There are three on Wessex; short term change (post CPPP), long term change (pre CPPP) and easement requests (from South West Railway). The short-term change request process is underpinned by an avoidable/unavoidable change matrix which helps categorise 'bad' and 'good' late change. This matrix is reviewed frequently to ensure it aligns with the Route business objectives and remains fit for purpose. Change requesters fill out a standardised form, with mandated fields on key data points. The data on this change request form will follow the agreed change control process depending on the content of the request and the decisions made by the access planning team. The change control process communicates with all appropriate stakeholders for review,

Region / Route	Initiative	Summary
		this includes the Engineering Access Planning Team for operator approval for disruptive requests, as well as schedule 4 impact assessments, which are approved at Route Managing Director level. An automated workflow in PowerAutomate will govern a change request through the process, automating status updates, service level agreement timings and email communications.
	Maximising Abnormals	A simple process to identify long possessions (those over 12 hours duration) in which more work could be completed and communicate with Works Deliverers to increase the volume of planned work, or to otherwise cancel or curtail the possession. (E-D-0672).

3.3.3 Assessment and findings

Theme 14: Best practice dissemination

We acknowledge that several national improvement programmes are in place to address key digital architecture, safety and efficiency issues in the business. We note that:

- The CoE accountabilities do not explicitly cover the capture of best practice with regards to planning and delivery of possessions. They conduct detailed oversight of specific busy periods, such as bank holidays and the Christmas and New Year period. Specific measures are monitored during these periods, followed by a review with lessons learnt and actions to drive improvements (E-D-0737).
- Efficiency benefits and estimate real savings are validated by the efficiencies team (E-C-0720). Network Rail is forecast to deliver efficiencies of around £450m in CP6 (E-D-0714).
- The APP reported that a high frequency of train-on-possession conflicts are resolved on the day by operational staff - 300 known cases in FY 2018/19 and 150 in FY 2019/20 (the reason for the reduction is unclear). These conflicts are a safety risk as well as a significant operational burden. A study into this problem identified that during timetable production there can be more than 40,000 conflicts per year. Lessons learnt with regards to these are not explicitly captured or embedded in a national programme.
- The APP reported that there is widespread resistance to changes to the PPS. The reason articulated in consultations was that the system is central to coordinating national efforts and that any potential failures would have an extremely large impact due to the thousands of users and multiple interfaces with other systems. However, PPS does not currently capture information in a format conducive to optimising the wider planning process (E-C-0314).
- Consultees noted that “There is a lot of data in the business and that this data is not being put to good use” (E-C-0800)
- The Safety Task Force noted that many (if not all) of the improvement initiatives described above will drive efficiency and safety through tighter control of rostering, better resource loading on signallers and other staff, significant reductions in rework/error during the booking of line blockages. The roll out of automated protection methods to possessions is a key enabler to achieve many of the benefits stated (E-C-0761). Eleven (11) different safety compliance measures are recorded per Route each month, driving accountability (E-D-0775). The measures are sufficiently embedded, although significant overlap is prevalent with other national programmes.

Communication of regional initiatives is occurring informally between Heads of Planning at their monthly meetings (E-C-0591). The key embedded initiatives driving efficiency observed during this review are:

- Eastern: Diamond model and detailed overruns monitoring
- North West and Central: HALO integrated planning which includes monitoring late changes to possessions
- Scotland: centralised planning tools and resources through Project Hannibal
- Southern: maximising worksites per possessions through maximising abnormals and monitoring lost work in possessions
- Wales & Western: use of BI tools to streamline access planning and monitoring of lost work in possessions.

Theme 15: Coordinated initiatives and best practice dissemination

The Infrastructure Strategy Board, which was mobilised and mandated in late 2020, aims to place a mechanism around the sharing of best practice. We noted that the process and governance surrounding this aim is still in its infancy (E-C-0800) and took into account the principles of a devolved business and administrating governance.

We found that:

- With the re-structure of Network Services, there does not appear to be a formally structured design authority or guiding mind (particularly for national improvement programmes) related to planning and delivery in the future.
- Previous national improvement programmes have not realised their benefits and were subsequently shelved. This was primarily due to inadequate governance arrangements (E-C-0314). We question how the existing national programmes will tie together - in particular, those that impact the wider industry. Regional enablement and coordination are key to unlocking efficiency benefits and fully realising devolution
- To illustrate the last point, there are six ELT (Executive Leadership Team) committees, one for each of the stated business priorities, and each one has at least one initiative relating to access. We observed that this overlap manifests itself through programme complexities. We found complex interfaces, divergent funding, competing timeframes and multiple overlapping benefits (E-C-0314).

3.3.4 Conclusion

Are Network Rail's possession efficiency initiatives embedded and best practice shared?

We acknowledge that through the Infrastructure Strategy Board and Planning and Access Steering Board, some steps are being made to setup a central coordinated governance entity for coordinated national programmes. The process and governance surrounding this body is still in its infancy (E-C-0800).

There are several improvement initiatives in motion, however there is a clear lack of communication and coordination across Network Rail's devolved Regions and Routes, with respect to identifying and communicating Route initiatives. It is not consistently applied and best practice is not effectively shared.

As Network Rail and the wider industry evolve and reform it will be important to make sure the role of national programmes enable Regional coordination and continue to share best practice effectively.

3.4 KR 7: Does the current framework enable the industry to best deliver for passengers and funders?

3.4.1 Overview

Over recent years, the ORR has been concerned that highly specified access rights impede the ability to optimise the timetable to make the best use of capacity, deliver performance, and reduce (or at least defer) the need for capital investment. The legal and regulatory framework for selling access rights was established at privatisation against the backdrop of expectations of a static railway and uncertainty about the post-privatisation environment. Train operators wanted to protect themselves against potential network degradation. Prescriptive rights provided a contractual basis for addressing this concern (and, given the flexibility available to planners, this was viable). Usage has subsequently dramatically increased, putting pressure on access for maintenance, renewal and enhancement.

It is timely to assess if processes based on the original premise are still valid in the current context, particularly as the commercial structure of operator contracts are changing. We explored in KR1 the Access Planning Framework (APF) and how it facilitates the determination and management of access once agreed. In this section we comment on the National Framework with best delivers for passengers and funders:

- Access Rights Framework (ARF)
- The Network Code
- Disputes and compensation mechanisms

3.4.2 Enablement context

Governance

Network Rail License Obligations

There are several conditions in Network Rail's network license that drive it to meet the needs of train operators. Condition 1 (Network Management) states that it should enable persons providing railway services and other relevant persons to plan their businesses with a reasonable degree of assurance and to meet their obligations to railway users.

Regulation

The regulations prohibit track access contracts from specifying any train path in detail and prohibit Network Rail[41] allocating capacity in the form of specific train paths for longer than a working timetable period (one timetable year). Set against a train operator's desire for certainty to meet its commercial needs, there is a statutory requirement for sufficient contractual flexibility to optimise timetabling potential[42]. This is to ensure that the infrastructure manager can make best use of the railway infrastructure over the life of the contract.

[41] Note: The regulations use the term "infrastructure manager"
[42] Note: Regulations 16(9) and 18(3)

The regulations require a track access contract[43] to be concluded before the capacity is used[44]. This is a contract between a beneficiary (usually a train operator) and Network Rail. Track access contracts generally capture:

- The access rights[45] held by the beneficiary: generally expressed in terms of an entitlement to have train slots incorporated in the working timetable to operate a train service over a defined part of the network
- Conditions and obligations attached to those rights, including charges; the performance regime; compensation for restrictions of use (for example, for engineering possessions); the rolling stock to be used; confidentiality provisions; and the liability of the parties to each other if things go wrong.

Network Rail

The System Operator directorate within Network Rail facilitates decisions on whether to support an operator's application for access rights. It undertakes this work in line with the concept of making 'best use' of capacity throughout the network, reflecting the priorities of funders and operators within the overall framework while complying with licensing and statutory requirements.

This is managed within Network Rail by the Access Rights Framework, which consists of Network Rail's access policy, its sale of access rights process, and the creation of the network-wide timetable. The ORR makes the final capacity allocation decision, considering its regulatory and wider legal duties. Network Rail's role is to provide information and analysis to the ORR to support its decision making.

Access Rights Framework (ARF)

Network Rail needs to make best use of network capacity to ensure a high performing railway that can deliver the growth forecasts and accommodate the needs of its customers at an efficient cost.

The principal regulatory obligations and process mechanisms in the context of our mandate are:

- Strategic Capacity
- National Principles
- The Network Code, its decision criteria (Part D) for access
- The track access contracts and compensation mechanisms.

Strategic Capacity

Network Rail has a Strategic Capacity Statement Code of Practice. This sets out how Network Rail produces its Strategic Capacity Statement, which details the strategic paths that are reserved for future use on key routes on its infrastructure.

Schedule 5 of the track access contract describes the operator's rights to run services on the network. It sets out the number of services between point of origin and destination, along with the characteristics of those services (e.g., service intervals, journey times, calling patterns and the types of rolling stock that can be used).

[43] Note: Regulation 16(10)
[44] Retrieved from: http://orr.gov.uk/what-and-how-we-regulate/track-access/guidance Office of Rail Regulation | March 2015 | Track Access Guidance | The regulation of access 3 10594177
[45] Note: An access right is any right conferred on a beneficiary by its track access contract with Network Rail. Access rights will represent a balance between:
- The beneficiary's need to ensure that it can meet its key commercial requirements (including franchise or commercial obligations) over the period of the contract.
- Network Rail's need for flexibility to optimise the use of network capacity in compiling a robust and reliable timetable reflecting the requirements of all beneficiaries; and
- Network Rail's need to reserve access to the network in order to maintain, renew and enhance it.

National Principles

The National Principles detail which diversionary routes are available when track sections are blocked and the approximate passenger diversion time and method. There are several rules that dictate how access to the track for possessions can be planned at a national level. These rules describe which routes and lines must remain open if another is closed, and how travel to strategic locations such as airports needs to be always available. We found these rules are informally referred to as “not withs” within the National Principles document (E-D-0257).

The Network Code

The Network Code is a common set of rules and industry procedures that apply to all parties who have a contractual right of access to the track owned and operated by Network Rail. The following definition is taken from the preface to the Network Code (E-D-0222).

“The Network Code is a set of rules which is incorporated by reference into, and therefore forms part of, each bilateral access contract between Network Rail and a holder of access rights. It does not create any contractual relationship between operators of trains. The purpose of the Network Code is:

- *To regulate change, including change to the working timetable, change to railway vehicles specified in an access contract, change to the network, change to computer systems and change to the Network Code itself.*
- *To establish procedures relating to environmental damage.*
- *To establish a performance monitoring system.*
- *To establish procedures in the event of operational disruption.”*

The Class Representative Committee (CRC) is charged with considering and approving changes to the Network Code under Part C. The rail industry can also propose changes to the Network Code through Part C. The ORR has a role to approve those changes as any modifications to the code may have a bearing on track access contracts. Part C conditions include:

- Condition C5, which provides an industry process whereby Network Rail, train operators or ORR can propose changes
- Condition C8, which provides the ORR with a unilateral right to make changes
- Part D 4.6, which describes the decision criteria that Network Rail must apply when reaching its decisions about changes to the timetable (E-D-222).

Part D Decision Criteria of the Network Code

The Decision Criteria provide Network Rail with the ability to prioritise conflicting services if those services have equal hierarchy of rights. The Decision Criteria impose a contractual requirement on Network Rail to meet the objective of sharing capacity in the most efficient and economical manner in the overall interest of users and service providers. There are two key parts of the Network Code that are relevant to this report:

- The rules surrounding the publication of the Engineering Access Statement
- Rules surrounding the disputes mechanism.

Compensation Schedules

To get the maximum value for the taxpayer from operator franchises (and to protect non-franchise operators from risk they cannot directly control) there is an automatic system of payments which seeks to leave train operators in a financially neutral position when their train services are unable to run as originally envisaged due to planned disruption. This regime is called Schedule 4 (E-D-0574). Schedule 8, meanwhile, is an automatic mechanism for ensuring that both Network Rail and train operators are held financially harmless for unforeseen delays that they cause to each other (E-C-0667). These mechanisms are described in detail in the Track Access Contracts (E-D-0876).

Schedule 4

Schedule 4 pays train operators for the financial impact of planned service disruption where operators are given restricted access to the network, principally because of Network Rail undertaking engineering work. The payments are calculated to reflect the revenue loss from reduced ticket sales and the costs incurred by train operators. Examples include running replacement buses in the case of passenger operators and a simpler regime of identical payment rates in the case of freight operators[46].

Schedule 4 payments for passenger operators are calculated using a model described in the template Track Access Contract (E-D-0876). The factors considered are:

- Revenue loss compensation is based on minutes of cancelled services and minutes of extended journey time for services which are not cancelled and weighed by a "busyness factor" and the notification factor
- Cost compensation which includes both estimated miles travelled by bus replacements and a measure of train mileage change, which may be negative where operators' trains travel for fewer miles (where a bus replacement is in place) or positive where they travel for more miles due to a longer diversionary route

The formula does not account for knock-on impacts to operator commercial interests that are not modelled, such as reputational damage due to passengers disliking longer travel times. Within the template Track Access Contract, there are three type of possessions defined:

- Type 1: a possession (or restriction of use) that does not fall into Type 2 or 3
- Type 2: a possession of more than 60 consecutive hours (excluding any part of that restriction of use which occurs during a public holiday) which results in a service being disrupted
- Type 3: means a single restriction of use of more than 120 consecutive hours (including any part of that Restriction of Use which occurs during a public holiday).

Passenger operators can claim additional cost compensation on Type 2 possessions and both revenue and cost compensation on Type 3 possessions, in a process known as a "re-opener". For example, they can claim that reputational damage done to their brand due to repeated disruption to travellers has cost them more revenue loss than is captured by the formula, because it has led to fewer ticket sales even in areas unaffected by this disruption.

The notification factor mechanism is a discount applied to the revenue portion of the formula calculation and is greater (meaning that the revenue compensation payment is lower) when earlier notification is given by Network Rail to the operator. There are three levels of discount, named "maximum", "medium" and "minimum". The exact amount of the discount varies in accordance with the terms of the applicable Track Access Agreement. As of the start of CP6 these ranged from 0.31-0.44, 0.60-0.69 and 0.88-0.93 respectively, having changed to be a lower minimum and higher maximum compared to the CP5 ranges. The maximum discount is applied to possessions which are agreed prior to D-26, that is, twenty-six weeks before the beginning of the next timetable, while the medium discount is applied to those agreed earlier than TW-22, that is, twenty weeks before the beginning of the week when the possession is to be delivered. In some Track Access Agreements in the Southern Region, the maximum and medium levels have the same discount factor, so that possessions agreed at any point before TW-22 receive the maximum discount.

Table 3.3 Schedule 4 Notification Factor discounts in early CP6 (source: (E-D-0572))

Discount level	Period applicable	Notification Factor	Equivalent discount
Maximum discount	Any time before D-26	0.31-0.44	56% to 69%
Medium discount	After D-26 but before T-22	0.60-0.69	31% to 40%
Minimum discount	TW-22 to TW-1 day	0.88-0.93	7% to 12%

[46] Retrieved from: Payments for planned disruption on the railway - Network Rail (networkrail.co.uk)

Schedule 8

Schedule 8 compensates train operators for the financial impact of unplanned service disruption due to the railway operating at a level of reliability lower than that assumed at the time when the terms of a franchise are agreed, through no fault of the train operator – for example if the signalling system is unreliable. Schedule 8 payments are automatically calculated and seek to leave train operators in a financially neutral position. This is the basis of the current performance regime in the rail industry[47].

Schedule 8 is applied to unexpected disruption and considered more straightforward to calculate than Schedule 4 (E-C-0533), and therefore does not have a major impact on the decision making involved in planning and delivering of possessions.

3.4.3 Assessment and findings

Theme 16: Access negotiation, EAS challenges and disputes

Several stakeholders reported that Network Rail avoids access dispute hearings wherever possible (E-C-0575), (E-C-0632) and that stakeholders have been advised against going to full dispute hearings by legal teams as they rarely win (E-C-0305), (E-C-0678). We note that the legal counsel given to Network Rail is that operators have an advantage in dispute hearings (E-C-0678) and adverse power during the negotiation process.

We reviewed a random sample of 12 disputes from 2020 to test this. We found that:

- All disputes were ruled in favour of the operator
- 10 disputes were settled “out of court” (meaning not settled by the disputes committee)
- 7 disputes resulted in possession easement to accommodate operator access
- 4 disputes involved unsatisfactory capacity studies.

The overall number of disputes (prior to being taken to hearing) tracked by the National Access Planning Team was 78 in FY 2018/2019, 104 in FY 2019/2020 and 65 as of the end of Period 8 in FY 2020/2021, indicating the number of access-related conflicts is increasing.

- Anglia and Sussex having consistently high numbers
- The volume of late notice possessions appears to correlate with a higher number of disputes
- The median resolution time for disputes closed since FY 2017/18 was 172 days, with the longest dispute stretching for 865 days.

[47] Retrieved from: Payments for disruption on the railway - Network Rail (networkrail.co.uk)

Figure 3.2 Dispute numbers by old Route structure (source: Network Rail (E-D-0531.)

It was stated by a freight operator that operators challenge most possessions in the EAS. This is because they have insufficient resources to respond in a timely manner to everything, and do not have clarity on their timetable 18 weeks out in order to make an assessment (E-C-0776). We note that part of the reason freight operators do this is because Schedule 4 does not consider potential loss of business of time-sensitive intermodal and other vulnerable traffic due to possessions (E-C-0776). This is reflected in the data, where ~20% of disputes originate from freight operators[48], whereas only 5% of track usage is due to freight (E-D-0594) - a dispute rate that is ~4 times higher compared to passenger operators. We note that:

- Certain operators provide detailed documents outlining their preferences and requirements in terms of accepting disruptive access, known as “Rules of the Resource”, but this has not eliminated conflicts between operators’ and Network Rail’s access planners (E-D-0848). Further, this is not a requirement within the Network Code or Track Access Agreements, and operators have no direct commercial incentive to agree access early (E-C-0678)
- Operators will put “holding comments” against almost every disruptive possession issued in the EAS (E-D-0730), (E-C-0575).
- Consultees cited the clause as being subjective. It was stated that precedent dictates that the level of detail required is more onerous than the Route access planning teams are able to reasonably achieve given the volume of possessions and the timeframes in which they need to be planned (E-C-0575).
- Network Rail’s ability to produce timetable/capacity studies and passenger handling plans is constrained. Production of these in a timely manner is a major contributor to the escalation of disputes (E-C-0095).

We found instances where the existing framework drives poor value against key industry value mechanisms simply because they are not explicitly captured. This issue is exacerbated because changes to the Network Code are difficult to achieve and deeper structural changes to industry mechanisms such as track access agreements are challenging.

[48] Retrieved from: List of Determinations - Access Disputes Committee (accessdisputesrail.org)

The Class Representative Committee[49] (CRC) must weigh decisions on a case-by-case basis, making wholesale changes challenging to implement (E-C-0667).

Despite these challenges, we see a clear need for a roadmap moving forward with regards to both the Network Code (Part D specifically) and the Track Access Agreements (Schedule 4 specifically). As demand on the network increased over the last 25 years, these aspects of the framework have encouraged a disproportionate focus on a proxy value of passenger disruption, rather than the true value of access to the industry as a whole. There are examples where this has led to perverse incentives being created and, subsequently, exploited (E-C-0678).

We observed consistent themes related to these conflicts and which are known to the APP (E-D-0458): They include:

- There is a large amount of manual effort in checking for train versus possession conflicts, and constant changes to the engineering plan
- Operators bidding with the expectation of requests for access easement being granted
- Late notice possessions and possession amendments made without notification given to operators.

Theme 17: Schedule 4 and the Notification Discount Mechanism

Schedule 4 and the Notification Factor discount mechanism are useful proxies for quantifying operator revenue and cost impact and indirectly passenger disruption. However, this mechanism can be difficult to interpret and estimate. The Network Code states that the first informal version (V0) of the Engineering Access Statement is published bi-annually at D-64, 64 weeks prior to the start of the bi-annual Subsidiary Timetable. At this point, the operators are given 4 weeks to review the EAS and provide feedback (E-D-0222).

Network Rail start all track access negotiations from a position of ***quantum rights***.

In terms of Freight operators, the market needs are different from those relevant to passenger operators. Fundamental to this is that the opportunity to transport freight from one location to another may arise, change or cease at very short notice. Network Rail facilitate negotiations with traffic “start-up” ahead of agreeing firm rights/windows in respect of that traffic.

The use of a ***windows-based*** approach is reflected in the freight model contract and provides the freight operator and their end customer with a time window.

Quantum rights and the windows-based approach form the basis when constructing timetables. The timetabling process (governed by Part D of the Network Code) is open to anyone who is a party to the Network Code by virtue of having a track access contract, or anyone who proposes in good faith to enter into such a track access contract and has agreed to be bound by Part D.

We note that:

- The framework has remained largely unchanged for several decades (E-C-0678)
- Due to the complexity of the operators’ commercial drivers, it is difficult for Network Rail to predict which types of access will be challenged (E-C-0799), (E-C-0628), (E-C-0305)
- The asset lifecycle cost is well understood in some parts of Network Rail but not well communicated to the planners and operators (E-C-0393)
- Specialists are employed and devote full-time effort to calculate Schedule 4 costs (E-C-0407)
- Freight operators, who are affected by overnight possessions to a greater degree than passenger operators, have indicated that in most situations, a diversionary route, even if significantly longer, would be an acceptable alternative (E-C-0776)

[49] Note: The CRC is responsible for considering and (where appropriate) approving Proposals for Change to the Network Code and the Access Dispute Resolution Rules

- Due to the notification discount mechanism, Network Rail are incentivised to secure cyclical Section 4 and 5 access early in the process to maximise notification discount factor. These cyclical access agreements tend to be agreed at the start of the year, as they “roll over” year-on-year in almost all instances (E-C-0533).

There is no incentive for operators to accept to additional disruptive engineering access to improve asset lifecycle costs. The industry is just not structured this way at present. We note that:

- An increase in Schedule 4 payments occurs where large enhancement or renewals projects are on-going. This can be seen very clearly with Western’s Schedule 4 payments being the highest among all the routes in FY 2017/18 and 2018/19, but among the lowest in FY 2019/20 after the end of its Great Western Electrification Programme
- The medium discount is rarely applied due to the short window of time in which it is applicable (D-26 to T-22) and the fact that this window often coincides with the handover from development planners to delivery planners
- The Schedule 4 compensation payments are discounted by a notification factor based on how much notice Network Rail gave to operators about upcoming disruptive access. The weight of the discount can change, and in fact did so in financial year 2018/19, with the maximum discount becoming greater (lower cost) and the minimum discount becoming lower (higher cost)
- A majority of payments was made under the minimum discount in most routes in the most recent full financial year, with the singular exception of LNE.

Figure 3.3 shows the total amount of Schedule 4 compensation payments from Network Rail to operators across three financial years and the pre-Putting Passengers First route structure[50].

Figure 3.3 Overall Schedule 4 compensation payments by old Route structure (source: NR S4 data (E-D-0572)

[50] Note: Payments are also coloured separately depending on the notification discount factor level that applied to them (maximum, medium or minimum). Note that this is despite the fact that the notification discount factor only reduces the Revenue Loss Compensation component of the payment, not the Cost Compensation component.

We did observe that the compensation mechanisms in place, as well as the timescales of the process itself, are an active barrier to agility.

Our reasoning:

- Schedule 4 is based on historic passenger numbers and not live passenger numbers and therefore penalises Network Rail regardless of whether passengers are on the trains or not
- The discount factor mechanism within Schedule 4 also penalises late changes to possession regardless of whether the change is in the best interest of the industry.

Both drivers have meant that intrusive work, (particularly in highly critical and normally high passenger flow sections of track) has rarely been accelerated to take place during the COVID-19 pandemic (E-C-0597), (E-C-0386). We acknowledge it is the domain of transport planners and the Passenger Demand Forecasting Council to attempt to predict what impact the crisis will have on future passenger demand. Clearly at present, and for some time to come, the passenger demand implied by Schedule 4 is significantly divorced from actual passenger movements. It is our finding that Schedule 4 is at the core of this distinct discrepancy.

Due to the short-termism of operator's existing franchise contracts, there is little incentive for the operators to be concerned about resilience of the asset base. Non-standardised engagement activities beyond the framework to reach consensus with operators prior to D-64, a sub-standard outcome (i.e., cancelled access) is, in places, highly likely. This is a clear demonstration that simply following the process as set out does not achieve results - strongly indicating that the framework does not, in present industry conditions, enable efficient and effective delivery.

3.4.4 Conclusion

Does the current framework enable the industry to best deliver for passengers and funders?

We can conclude that Schedule 4[51] and the Notification Discount Mechanism is not fully understood by Network Rail and cost impact is dislocated from planning activities.

We conclude that there is a distinct lack of understanding regarding the Network Code, access cost and the impacts of disruption. This is the underlying issue at the heart of several inefficiencies in the system. There is a clear need to align governance of the Network Code (Part D specifically) mechanisms and the Track Access Agreements (Schedule 4 specifically) in unison with evolving industry commercial structures.

It is our view that the National Framework characterises a conflation of an engineering planning process with a set of commercial structures attached to it. This has over time become cumbersome (and complex) for the Route planning functions to navigate. The framework does not best deliver to passengers and funders, for the reasons discussed above.

The National Framework (specifically the Network Code and compensation mechanisms such as Schedule 4) requires cross-industry review and education to ensure that it drives efficient possession planning and delivers value to the industry. It must remain aligned to the structure of the industry in the long term as government reform is being implemented and operator commercial structures change. We have identified several areas where the National Framework does not facilitate a balanced consensus between Network Rail and operators (both passenger and freight). Whole industry value must be taken into consideration when determining access costs versus disruption. A holistic approach to determining "best use" is needed.

Our recommendations are far-reaching and challenging. However, consolidation and coordination of benefits would unlock efficiencies across the business. We conclude that the unique pressure placed on the industry by the COVID-19 crisis and the subsequent mitigations being implemented (such as ERMAs) in conjunction with wider industry reform, presents a unique prospect in time.

[51] Note: To get the maximum value for the taxpayer from operator franchises (and to protect non-franchise operators from risk they cannot directly control) there is an automatic system of payments which seeks to leave train operators in a financially neutral position when their train services are unable to run as originally envisaged due to planned disruption. This regime is called Schedule 4 (E-D-0574).

3.5 Recommendations

3.5.1 Centre of excellence for possessions

We recommend that the CoE for P3M is replicated in the SO under this entity to specifically focus on possessions. This hub's sole responsibility should be to collate, communicate and ensure specific simple information is communicated to the wider business (such as high level aims and objectives, cost, forecast benefits, owners and timescales). This should complement/amalgamate with the planners best practice forum.

It is our view that the devolvement and independence the Routes have gained should not be compromised. There are unique, replicable, and innovative initiatives across Routes. This culture of thinking should be maintained and fostered. For this reason, the "hub" should not direct activities, but identify, communicate and harmonise good practice with the aim of progressing of key initiatives. The benefits of this approach would be much reduced rework and miscommunication whilst enabling collaboration and innovation.

Recommendation NF1	Set-up a Centre of Excellence related to possessions in the System Operator. This should coordinate national programme benefits and share best practice from regional initiatives. This should complement/amalgamate with the planners best practice forum.		
	Ease	**Impact**	**Owner**
	Easy	Low	System Operator

3.5.2 Industry value & cost model

We recommend that a wider model of industry risk, cost and value should be developed that takes into consideration asset risk, asset lifecycle cost, and disruption. This should be based on Green Book principles that underpin infrastructure investment decision-making within the UK government. Network Rail should also consolidate the quantum of rights, widows - based approach and socio-economic principles within the Network Code.

Actions should include:

- The model should be developed based on two key concepts: cost of access and disruption impacts
- Development of a roadmap to achieve benefits
- Consolidation of governance under one national programme such as Intelligent Infrastructure Planning workstream
- Consideration should be given to asset risk and asset lifecycle cost
- Integration of this model with the DWWP. This should align quantitative risk models, optimism bias and benchmarked access costs.

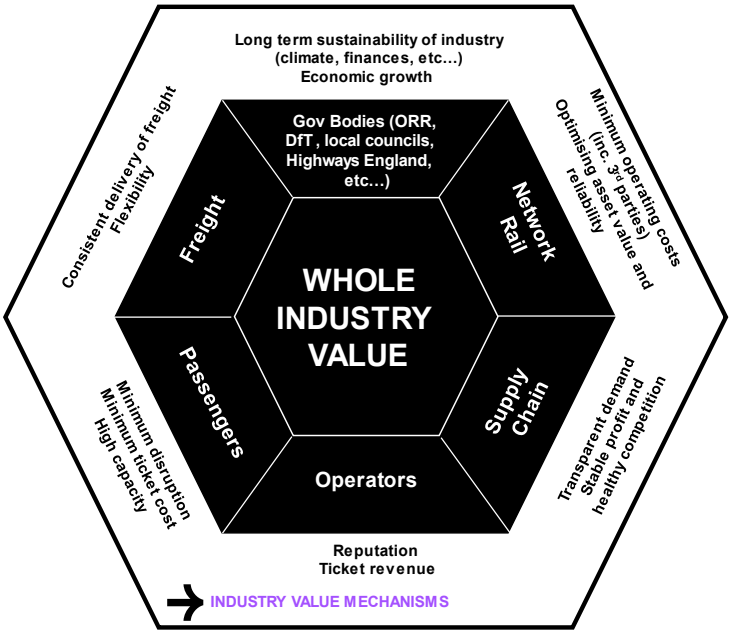

Figure 3.4 Whole industry value (source: GHD)

The outcome will enable impacted stakeholders to communicate more effectively and efficiently and understand the relative value of access and disruption to each stakeholder. It will help drive improvements to the frameworks, systems and processes that drive true whole industry value. If this model is refined to a point that it is trusted by the industry, it could be included in track access contracts.

Recommendation NF2	We recommend that a wider model of industry risk, cost and value should be developed that takes into consideration asset risk, asset lifecycle cost, and disruption. This should be based on Green Book principles that underpin infrastructure investment decision-making within the UK government. Network Rail should also consolidate the quantum of rights, widows - based approach and socio-economic principles within the Network Code.		
	Ease	**Impact**	**Owner**
	Medium	High	System Operator

3.5.3 Network Code review

We recommend that as part of Period Review 2023 (PR23) and the next Control Period planning (CP7) preparations, the System Operator (SO) should consolidate and produce a white paper detailing the future blueprint of the Network Code. As part of this review the following should be considered:

- Consolidation of governance under one national programme such as GRAI
- Education and improved level of understanding of Part D of the Network Code
- Education and level of understanding of the access negotiation process
- Future legislation strategy
- Agreement of a direct incentive in the Network Code for operators to make it easy for Network Rail to understand their commercials and to agree access early.

To action:

- Detail why the T minus 7 lock down is so ineffective
- Define good and bad late changes
- Determining the terms of reference for the value and cost model
- Finally, the development of a joint industry roadmap. This roadmap should identify the Network Codes future in line with changing commercial arrangements away from operators' franchise/concessionary contracts and how it will act in a future of direct award contracts.

We acknowledge that changes to the Network Code are difficult given conflicting stakeholder requirements. However, we believe now is an opportune moment to make these reforms in view of the significant changes already made to the industry in 2020. If correctly implemented, these changes will ensure the correct incentives are in place to drive whole industry value.

The outcome should be to achieve industry consensus and commitment to implement changes to the Network Code, and a working process for periodic review of the same. Whilst this outcome clearly requires effort from several key industry bodies, we recommend that NR acts as project manager and takes responsibility for setting project timescales and developing implementation plans.

Recommendation NF3	To inform the Period Review 2023 (PR23) and the next Control Period planning (CP7) preparations, there should be production of a white paper detailing a future strategy for the Network Code. This must set out a programme to align governance of Part D of the Network Code and access negotiation process protocols.		
	Ease	**Impact**	**Owner**
	Hard	Medium	GRAI

Appendix A

Abbreviations

Abbreviation	Description
ADRR	Access Dispute Resolution Rules
APP	Access Planning Programme
CARRS	Civils Asset Register and Reporting System
CoE	Centre of Excellence
CP	Control Period
CPPP	Confirmed Periodic Possession Plan
CRC	Class Representative Committee
DFT	Department for Transport
DPPP	Draft Periodic Possession Plan
DWWP	Delivering Work Within Possessions.
EARSS	Engineering Access Requests & Reporting Systems
EAS	Engineering Access Statement (formerly Rules of the Route)
ECML	East Coast Mainline
ELR	Engineer's Line Reference
ELT	Executive Leadership Team
FOC	Freight Operating Company
GHD	Gutteridge Haskins and Davey
GRIP	Governance for Railway Investment Projects
GWML	Great Western Mainline
GZAC / GZAM	Green Zone Access / Green Zone Access Manager
HE	Highways England
II	Intelligent Infrastructure
IIP	Intelligent Infrastructure Planning
IMDU	Infrastructure Maintenance Delivery Unit
IP	Industry Planning
IPO	Industry Planning Office
ITPS	Training Planning System
LOR	Lines of Route
MDUs	Maintenance Delivery Units
NAP	National Access Planning
NR	Network Rail
NROL	Network Rail Online Logistics
ORR	Office for Road and Rail
OTM	On-Track Machine
PACE	Project Acceleration in a Controlled Environment
PICOP	Person in Charge of Possession
POIC	Possession Overrun Information Capture
PPS	Possession Planning System
PR18	Periodic Review 2018
RAMS	Route Asset Management Teams

Abbreviation	Description
ROCs	Rail Operating Centres
SATWAS	Semi-autonomous Track Warning Systems
SBPs	Strategic Business Plan
SJ	Standard Job
SSOWPS	Safe System of Work Pack
T-CODs	Track Circuit Operating Devices
TfW	Transport for Wales
TIPLOC	Timing Point Location
TOC	Train Operating Company
TOWS	Train Operating Warning System
TPS	Train Planning System
TS	Transport Scotland
WON	Weekly Operating Notice

Appendix B

Glossary

Term	Definition
Informed Traveller Timetable (ITT)	Produced at least 12 weeks out from delivery of the week being planned. The Train Service Data Base (TSDB) is the electronic version of the WTT. It holds train records which can be updated with amendments until 22:00 hours the day prior to operation to reflect the latest plan. 12 weeks out from the week being planned downstream systems are populated with data from TSDB so as to allow visibility of the amended plan in compliance with the railway industry Informed Traveller Licence condition. This licence condition mandates that Train Operators and their customers be able to offer / make bookings for advance purchase tickets and reservations at least 12 weeks prior to the date of operation.
Capital Expenditure (CAPEX)	A budget provided for one-off enhancement / renewal schemes.
Confirmed Period Possession Plan (CPPP)	Produced 26 weeks out from the delivery of the period being planned. This describes the detail of what is in the disruptive engineering access agreed in EAS.
Draft Period Possession Plan (DPPP)	Produced 30 weeks out from the delivery of the period being planned. Provided to TOCs and FOCs for review and agreement so that the CPPP can be published.
Engineering Access Statement (EAS)	Formally known as Rules of the Route (ROTR). EAS describes the allowance of network capacity for engineering access that is disruptive to the Train Operating Company (TOC) / Freight Operating Company (FOC) timetabled services. It also describes the parameters of engineering access not disruptive to WTT services. This would include: Standard Possession Opportunities (guidance on possession times that are available) Midweek possession strategy Major / disruptive possessions that cannot be contained within the standard possession opportunities
Engineering Access	A group term used to describe track access for engineering works / projects.
Engineering Trains	Trains operated by Route Services for the purpose of delivering and removing bulk materials to / from network locations. This includes On-Track Machines (OTMs) but does not include On-Track Plant (OTP).
Heavy Resources	Group term used to describe bulk materials (S&C, rail, ballast, sleepers) and major services and plant (haulage, wagons, OTM and Road Rail Vehicles (RRVs)).
Isolation Plan	Developed as part of the possession plan, this describes the requirements for the switching off and earthing of traction power supply equipment.
Late Change	For the purposes of this document late change is any change (as defined in Clause 8.2) proposed after the lockdown or the deadline specified by the Route.
Line Blockage	A section of railway track that is closed in accordance with Rule Book requirements to all rail traffic, including OTP, for the purpose of carrying out maintenance which shall include any repair, alteration, reconditioning, examination or testing of infrastructure.
Network Rail Online Logistics (NROL)	The computer system used to capture and manage heavy resource and seasonal / infrastructure monitoring services.
Notification Factor Mechanism	Mechanism within Track Access Contracts that penalises late changes to access plans.
Operational staff	Operations Manager (OM), Local Operations Manager (LOM), Mobile Operations Manager (MOM) and Signallers.
Operational Expenditure (OPEX)	The key day-to-day expenditure of the company.
Possession	An Engineering Possession on a running line where a section of track is closed to normal traffic and where the closure is for the purpose of carrying out maintenance which shall include any repair, alteration, reconditioning,

Term	Definition
	examination or testing of infrastructure. Also known as a “Restriction of Use” in legal parlance.
Possession Plan	The plan held in PPS that describes the duration, location, limits of all possessions, including details of activities taking place within possessions and arrangements for altering TOC and FOC services around them where necessary.
Possession Planning System (PPS)	The computer system used to record and publish possession plans.
Resource Plan	The plan held in NROL, Primavera and several local systems that describes ET, OTM, labour, small plant and materials needed for the possession plan and for minor activities not undertaken in possessions.
Route Services	Route Services Supply Chain Operations – A functional unit within Network Rail responsible for the planning and delivery of ‘heavy’ resources (e.g., ballast, rail, sleepers, tampers), infrastructure monitoring and seasonal services.
Timescales	D (was TT) – The number of weeks until the commencement of the working timetable. TW (also known as T) – Is the number of weeks to the day of possession. Network Rail Timetable Variations are planned by Network Rail on a week-by-week basis. Each week of a Working Timetable is referred to as a “Timetable Week”. Each Timetable Week commences at 00:01 on a Saturday and expires at 24:00 on the following Friday. The sequence of events by which variations are finalised is designated by a series of milestone dates and steps, all of which refer to a week in the period prior to the commencement of Timetable Week “TW”. So, for example, “TW minus 12” (or “TW-12”) refers to the 12th week prior to the start of a given Timetable Week “TW”.
Track Access Contract	Contract between Network Rail and operator based on the Model Track Access Contract.
Track Alliance	Geographically focused alliances between Network Rail, designers and construction suppliers set up for the delivery of track renewals.
Weekly Operating Notice (WON)	Produced eight days from the week being planned. This contains all that is in the draft WON plus any urgent access amendments identified since the publication of the draft WON.
Work Deliverers	Is a generic term for Network Rail and contractor staff responsible for planning and executing engineering works. The term within Network Rail applies to roles with varying titles within IP and Route Operations.
Worksite	A discrete area of physical activities within a possession defined by physical marker boards. There may be one or more Sites of Work within a Worksite. Worksites must exist within the limits of a possession. The safety of a Worksite is controlled by an ES, COSS, SWL and SWM. In PPS a Worksite is labelled a Primary Worksite in order to distinguish it from a Site of Work (Subsidiary Worksite).
Working Timetable (WTT)	The baseline timetable developed and published annually. Alterations to the WTT in order to conduct engineering work are classed as disruptive.

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Appendix D

Route Data Capture

Route Data Capture

By assigning an information management maturity score, we can highlight and draw out best practice to enable dissemination and implementation across the organisation. Scoring and assessment details can be found in Appendix D.

We found four measures that are being monitored to a greater and lesser extent across the organisation, from disparate PDFs and spreadsheets used to record compliance, to self-service dashboards driving day-to-day decision making. The measures are:

- Time in possessions
- Lost work in possessions
- Possessions overruns
- Late changes to plan.

Process monitoring maturity scoring levels and criteria (source: GHD)

Level	Description	Decision making	Information management	Data quality
1	Initial: Few measures for analysing efficiency	Tribal knowledge, gut-feel decisions, hierarchical structure	PDFs, unstructured data, word of mouth	Silos, scattered data, inconsistencies accepted
2	Managed: Basic management processes and controls established to track progress. Work units use some procedures that have proven to be efficient	Functional process orientation, data driven decisions, quality by inspection	Local, disparate spreadsheets	Recognition of inconsistencies but no management plan to address
3	Standardised: Proven measures to monitor and drive efficiency. Cross functionality understood.	Integrated processes, performance metrics, data driven decisions	Semi-manual data workflows	Some data cleansing at consumption in order to attempt data quality improvement
4	Advanced: Detailed measures of process and output quality. Processes managed, controlled and forecasted using quantitative techniques (and statistical algorithms)	Self-service dashboards and analytics, exception management	Automated data workflows	Data Quality KPI's and conformance visibility, cleansing at source

Time in Possessions

Time in possessions refers to the actual time to complete standard tasks such as start and finish time of possession; time to take possession, time to hand back possession; and start and finish time for various worksites. This data can then be compared against the plan or more generally analysed to understand the use of possessions time. The Routes are hampered with regards this measure due to the lack of a national solution to efficiently and effectively capture and process time in possessions data, although it is noted that Intelligent Infrastructure Planning is aiming to rollout a solution to address this issue. In the main, routes are capturing this data as part of compliance, but due to the disparate and inconsistent formatting (such as PDFs and excel spreadsheets), it is not practicable to do meaningful analysis. It is our view that significant benefits can be gained through understanding time in possessions data to drive improvements in optimising worksites in possessions, providing information to drive business case to rollout automate protections technologies and to understand sources of errors and waste in delivery.

Time in possessions - process monitoring maturity scores by route

Route	Commentary	Citations	Score
East Midlands; North and East; East Coast	**Information management:** possessions performance and timings data are captured by the PICOPs routinely in PDFs for compliance purposes and not processed past this point. [1] **Decision making:** information is only captured for audit purposes and not used to drive improvements other than anecdotally. [1] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0689) - (E-D-0691)	1.67
Anglia		(E-D-0823)	
Kent; Sussex	**Information management:** data is collected on start time and finish time and early hand backs in disparate spreadsheets [2] **Decision making:** data is used to drive improvements, however, this data is not trended over time and there is no in depth data analysis to identify pressure points and/or root causes (acknowledging that this is done through lessons learnt workshops). [2] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0379)	2.33
North West; Central; West Coast South		(E-D-0562) - (E-D-0565)	
Scotland		(E-D-0811)	
Wales		(E-D-0803) - (E-D-0804)	
Scotland Alliance		(E-D-0807)	
Wessex	**Information management:** data is collected on start time and finish time and early hand backs using mobile data collection and SharePoint list. This data is not currently visualised using BI (although this is an aspiration). [3] **Decision making:** data is used to drive improvements through in depth analysis of root causes and analysis of benefits realisation data. Data is trended over time. [4] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-1107) - (E-D-1106) - (E-D-1102) - (E-D-1097) - (E-D-1112)	3.33
Western	**Information management:** data is collected on start time and finish time and early hand backs using mobile data collection and BI platform [4] **Decision making:** data is used to drive improvements, data is not trended over time and there is no in depth data analysis to identify pressure points and/or root causes (acknowledging that this is done through lessons learnt workshops). It is noted that this level of monitoring is planned using the above mentioned collection and visualisation solution [2] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0839)	3.00
Central Alliance	**Information management:** No evidence was observed that data is collected against time in possessions [1] **Decision making:** decisions are made using gut feel [1] **Data quality:** [N]	(E-D-0809)	1.00
Southern Alliance	**No engagement with this review to date**	N	N

Lost Work in Possessions

Lost work in possessions (or “slipped” work) refers to work that was planned to be delivered in the possessions but was not. This work must then be delivered in a subsequent possession, creating rework, or dropped entirely, presumably causing reductions in reliability. There is a process to capture renewals delivered versus planned as this advises national KPIs around renewals volumes and is part of the lifecycle modelling done by the asset management and engineering teams. This measure therefore focusses specifically on causes of lost work and linking this back to the planning of possessions to drive improvements. These causes might include supply chain issues, late engineering trains or late running of scheduled trains.

Lost work in possessions - process monitoring maturity scores by route

Route	Commentary	Citations	Score
East Midlands; North and East; East Coast	**Information management:** no evidence was observed that lost work data is collected or used to drive improvements with regards to the planning and delivery of possessions. [1] **Decision making:** decisions are made using gut feel [1] **Data quality:** [N]	N	1.00
Scotland		N	
Kent; Sussex	**Information management:** lost work data is being collected through disparate spreadsheets that are then collated through a semi-manual data pipeline for visualisation on BI platform [3] **Decision making:** data is trended over time and root cause data analytics visualised on a self-service dashboard. This is used to drive continuous improvement of the process element and reduction of inefficiency and waste. [4] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0370) (E-D-0375)	3.33
Anglia	**Information management:** data is collected on lost work in disparate spreadsheets [2] **Decision making:** data is used to drive improvements, however, this data is not trended over time and there is no in depth data analysis to identify pressure points and/or root causes (acknowledging that this is done through lessons learnt workshops). [2] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0823)	2.33
North West; Central; West Coast South		(E-D-0562) - (E-D-0565)	
Wales		(E-D-0803) & (E-D-0804)	
Western		(E-D-0587)	
Scotland Alliance		(E-D-0807)	
Wessex	**Information management:** data is collected on start time and finish time and early hand backs using mobile data collection and SharePoint list. This data is not currently visualised using BI (although this is an aspiration). [3] **Decision making:** data is trended over time and root cause data analytics visualised on a periodic reporting. This is used to drive continuous improvement of the process element and reduction of inefficiency and waste. [3] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]		3.00
Central Alliance	**Information management:** no evidence was observed that lost work data is captured or monitored. [1] **Decision making:** decisions are made using gut feel [1] **Data quality:** [N]	(E-D-0809)	1.00
Southern Alliance	**No engagement with this review to date**	N	N

Possession Overruns (causing disruption to passengers)

Overruns that cause disruption to passengers are automatically logged as part of the Schedule 8 payment mechanism. Routes and regions are required to log possession data into the Possession Overrun Information Capture (POIC) database so that causes of overruns can be monitored and sustainable reductions in overruns enabled through improvement initiatives. This data is accessible, consistent and accurate but is not being used at route level in most cases. Despite this, due mainly to introduction of the Delivering Work Within a Possession (DWWP) process there has been a sustained year-on-year reduction in overruns causing disruption for the last 5 years (E-D-0760). It is our view that to continue this trend, a deeper understanding of the root causes will be required and that improving maturity in information gathering and analysis will aid this.

Possession overruns - process monitoring maturity scores by route

Route	Commentary	Citations	Score
East Midlands; North and East; East Coast	**Information management:** overruns information is inputted into the central POIC database and then processed through an automated data pipeline for visualisation on BI platform [4] **Decision making:** data is trended over time, statistically analysed and root cause data analytics visualised on a serf-service dashboard. This is used to drive continuous improvement of the process element and reduction of inefficiency and waste. [4] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0603)	3.67
Anglia	**Information management:** data is collected on overruns and stored and collated in spreadsheets through a semi-manual process [3] **Decision making:** this data is trended over time but no evidence was seen of in-depth data analysis to identify root causes (acknowledging that this is done on a case by case basis through lessons learnt workshops). [3] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0824)	3.00
Kent; Sussex		(E-D-0358) - (E-D-0367)	
Western		(E-D-0587)	
North West; Central; West Coast South	**Information management:** data is collected on overruns in disparate spreadsheets and not processed further [2] **Decision making:** data is used to drive improvements on a case by case basis, however, this data is not trended over time and there is no in depth data analysis to identify pressure points and/or root causes (acknowledging that this is done through lessons learnt workshops). [2] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0562) - (E-D-0565)	2.33
Scotland		(E-D-0816)	
Wales		(E-D-0803) & (E-D-0804)	
Scotland Alliance		(E-D-0807)	
Wessex	**Information management:** data is collected on overruns and stored and collated in spreadsheets through a semi-manual process [3] **Decision making:** this data is trended over time, with some root causes but limited in-depth data analysis to identify root causes (acknowledging that this is done on a case by case basis through lessons learnt workshops). [3] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-1097) (E-D-1112)	3.00
Central Alliance	**Information management:** data is collected on overruns in disparate spreadsheets, semi-manually processed and collated into a single disruption metric [2] **Decision making:** only a single metric was observed. This metric didn't capture specific information about overruns but a wider metric around disruption as whole. [1] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0809)	1.00
Southern Alliance	**No engagement with this review to date**	N	N

Late Changes to Plan

Late changes refer to changes to start or finish time of possessions, or creation or cancellation of possessions, after the issue of the CPPP (T-26). Changes after this deadline can impact operator commercials as the timetable is based on the CPPP. For this reason, changes are subject to minimum discount. From a possession planning and delivery process efficiency perspective, the picture is less clear, and there is some debate about what constitutes a "good" change or a "bad" change. It is clear that some changes are "bad" and could have been avoided. This measure aims to identify and monitor the frequency of bad changes, driving improvements that will decrease them.

Late changes to plan - process monitoring maturity scores by route

Route	Commentary	Citations	Score
East Midlands; North and East; East Coast	**Information management:** data is collected on late changes and stored and collated in spreadsheets through a semi-manual process [3] **Decision making:** evidence was observed of a relatively mature specification and monitoring of late changes, with reasons for changes categorised and analysed, lessons learned used to drive improvements to process [3] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0698) (E-D-0705)	3.00
Kent; Sussex		(E-D-0371), (E-D-0372)	
Wessex		(E-D-1097) (E-D-1112)	
Anglia	**Information management:** data is collected on late changes and stored and collated in spreadsheets through a semi-manual process [3] **Decision making:** late changes are monitored and trended over time. This is used to drive improvements on a case-by-case basis, but there was limited evidence observed of data analysis of root causes of issues. [2] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0824)	2.67
Scotland		(E-D-0816)	
Scotland Alliance		(E-D-0807)	
North West; Central; West Coast South	**Information management:** data is collected on late changes and stored and collated in spreadsheets through a semi-manual process [3] **Decision making:** data is trended over time and root cause data analytics visualised on a self-service dashboard. This is used to drive continuous improvement of the process element and reduction of inefficiency and waste. [4] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0862)	3.33
Western		(E-D-0514)	
Wales	**Information management:** data is collected on late changes in disparate spreadsheets and not processed further [2] **Decision making:** late changes are categorised and monitored. This data is managed on a case-by-case basis and not trended or analysed to a great level of detail. [2] **Data quality:** data captured appears consistent and accurate, no evidence of any data quality KPIs or targets [3]	(E-D-0803) (E-D-0804)	2.33
Central Alliance	**Information management:** no evidence was observed that late changes data is captured or monitored. [1] **Decision making:** decisions are made using gut feel [1] **Data quality:** [N]	(E-D-0809)	1.25
Wessex; Southern Alliance	**No engagement with this review to date**	N	N

Appendix E

Route Data Figures

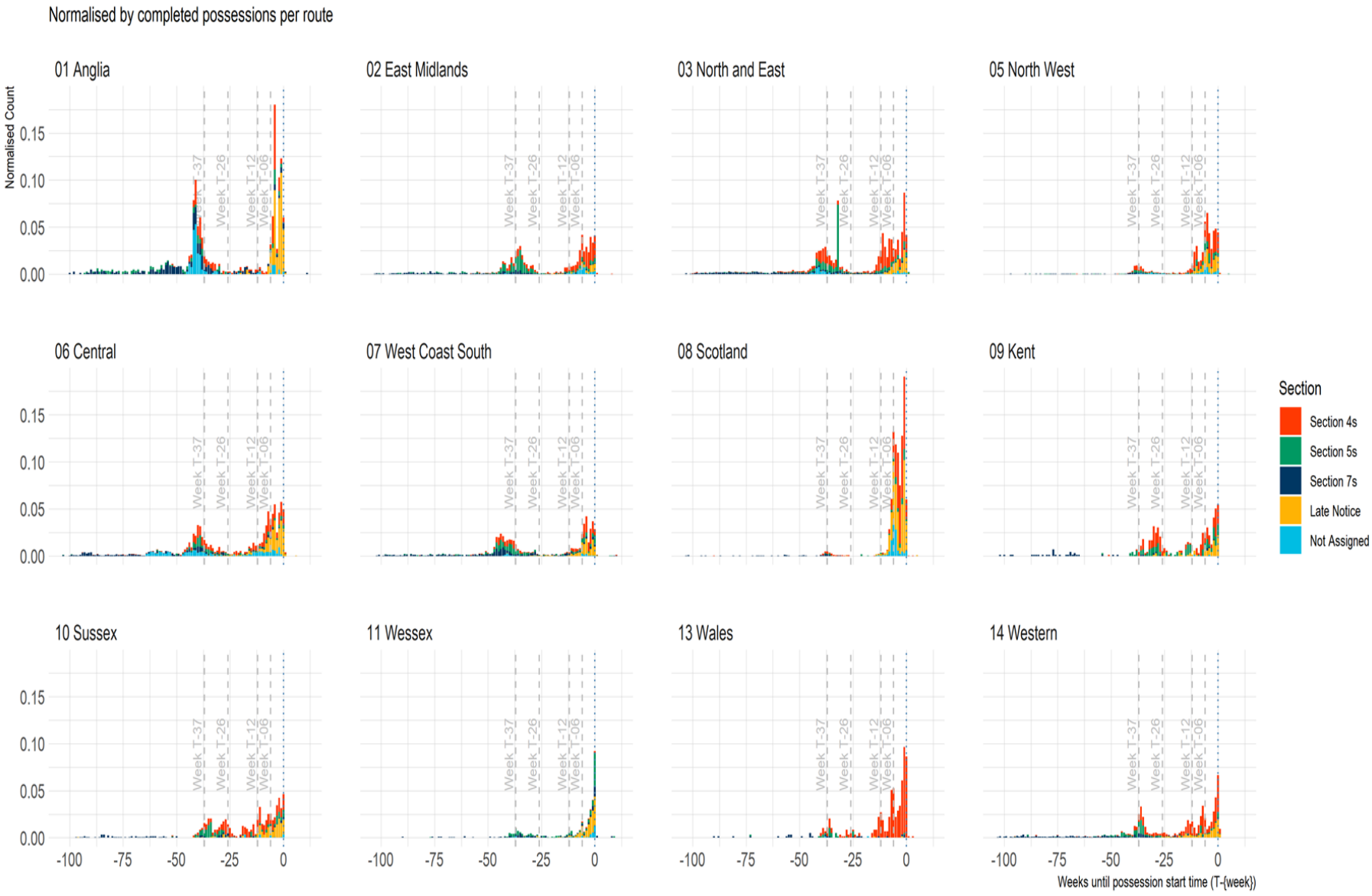


Figure E.1 Possession start-time change by T-minus week by Route (source: PPS)

Read as: For Wessex Route, over 5% of the total possessions for the year are cancelled in the week before they are scheduled to be delivered. This is largely driven by cancellations Section 5 and Late Notice Possessions.

Date range: 2019-01-01 to 2019-12-31

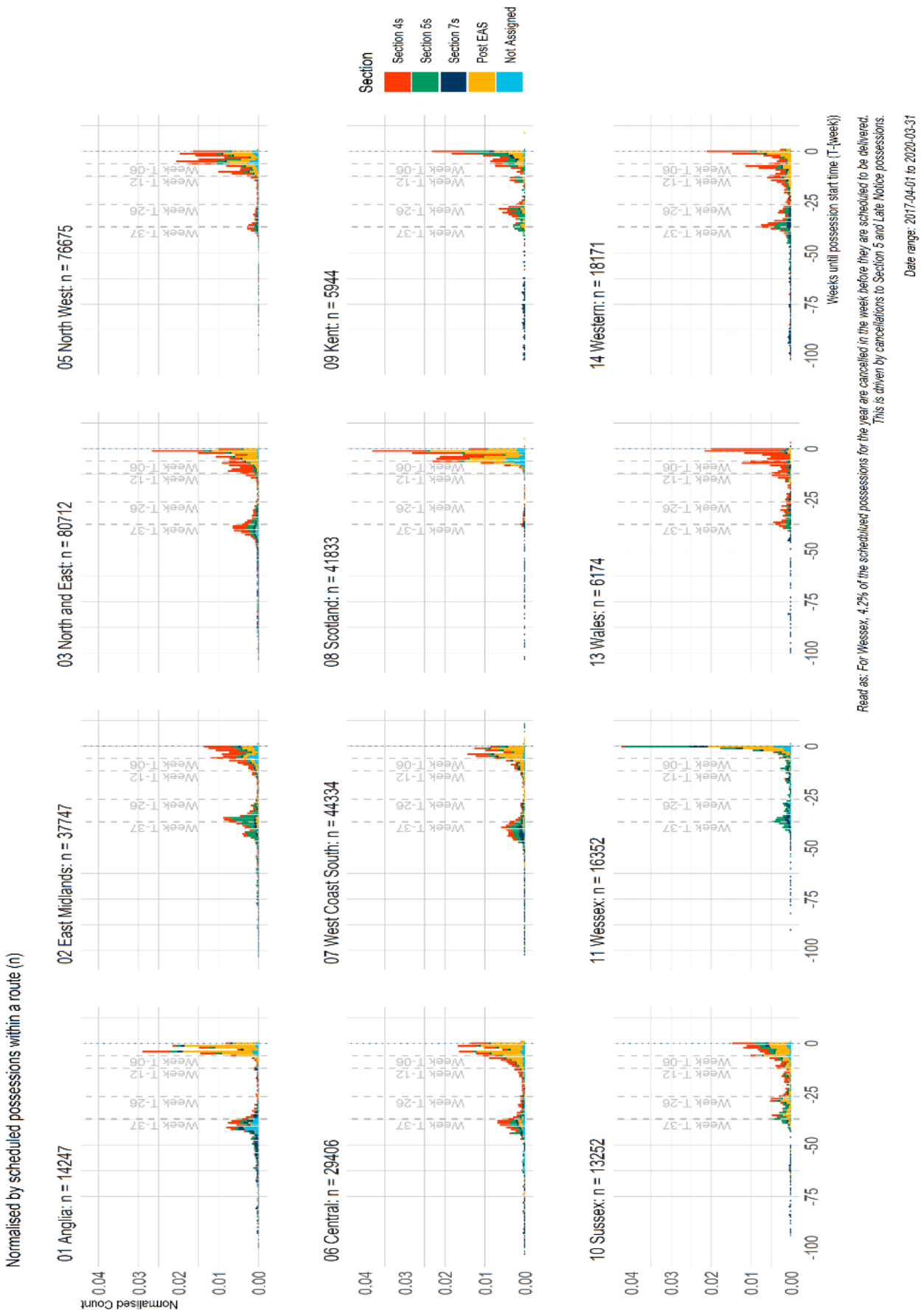


Figure E.2 Possession time remaining until D-Day when a possession is cancelled by T-minus week (source: PPS)

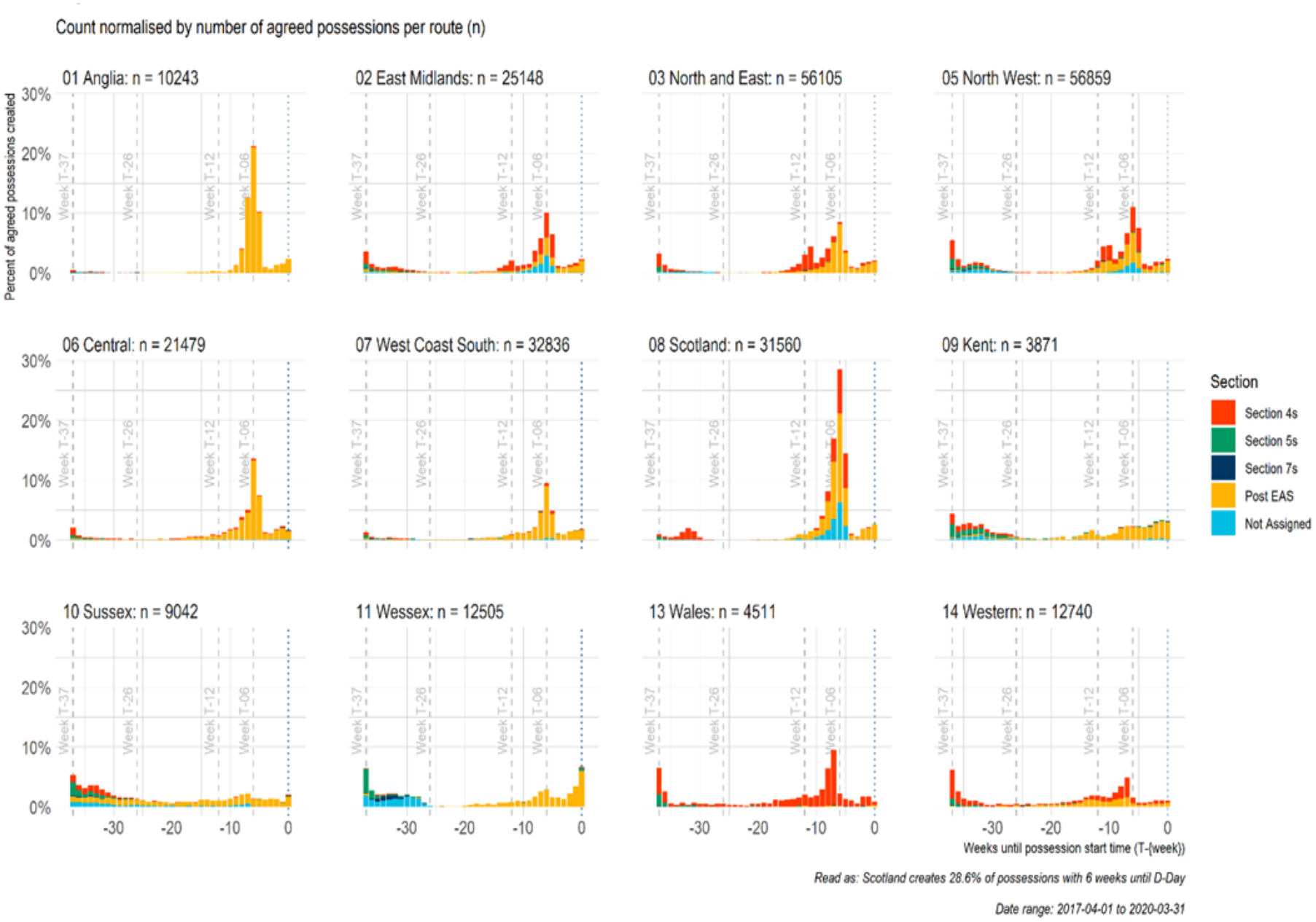
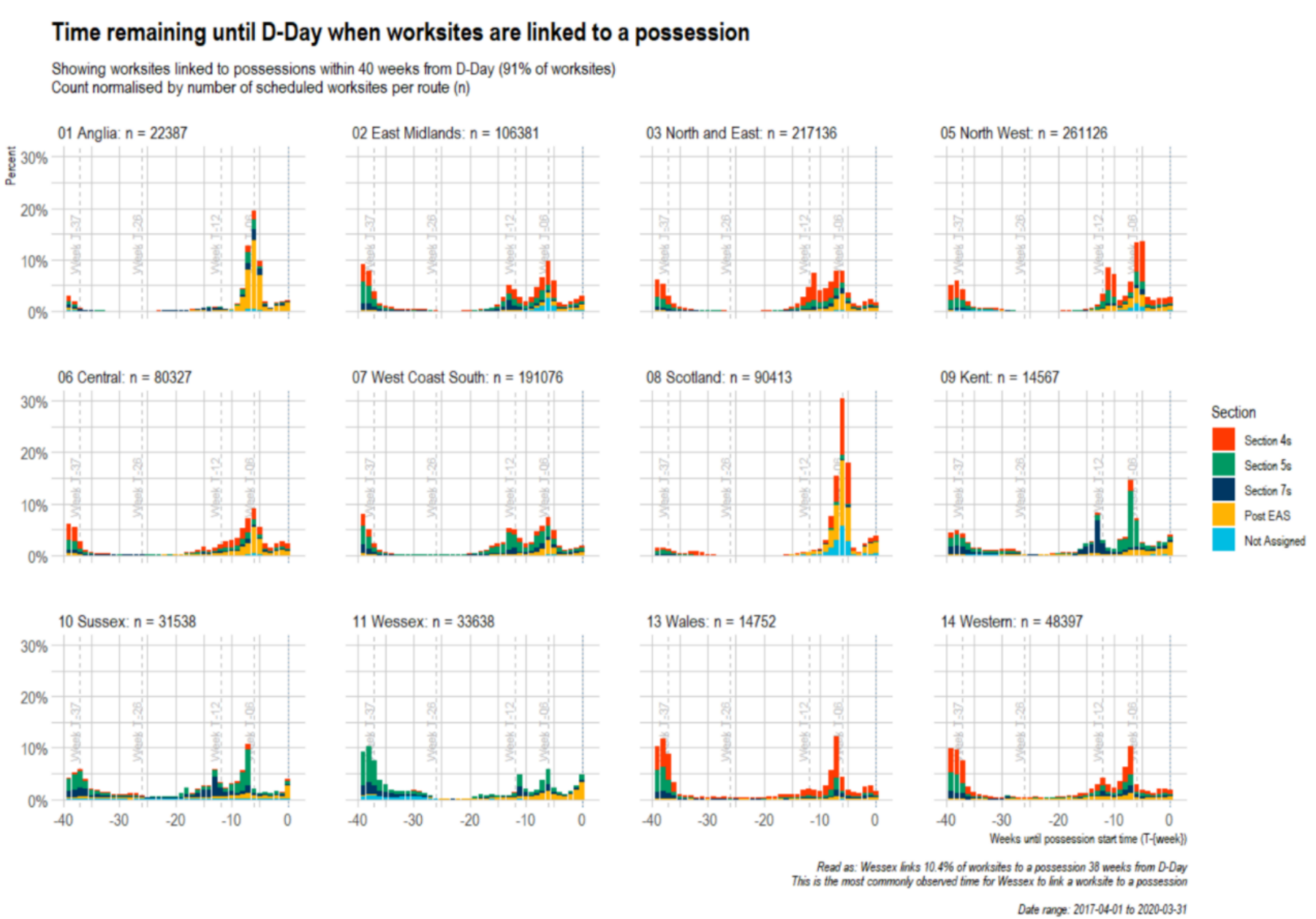


Figure E.3 Agreed Possessions created with a lead time of less than T-38 by Route (source: PPS)

Figure E.4 Link between worksite and possession records in T-minus weeks by Route (source: PPS)



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