Rail Delivery Group

National Rail

RDG Guidance Note: Depot Performance Handbook – A Good Practice Guide

RDG-ENG-GN-009
Issue 1.0 – December 2022

About this document

Explanatory Note

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Other Guidance Notes or Approved Codes of Practice are available on the Rail Delivery Group (RDG) website.

Executive Summary:

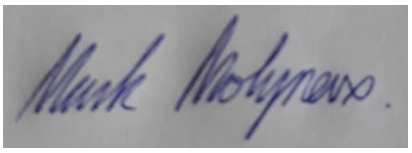
This Guidance Note describes and outlines good practice that organisations should consider when trying to assess the performance of their depots, yards, or sidings and whilst considering related performance improvement initiatives.

Issue Record

Issue	Date	Comments
0.2	September 2022	Initial Draft for 701A-OG Comment
1.0	December 2022	First Issue for Publication.

This document will be reviewed on a regular 3-year cycle, if not updated more frequently.

Written by / Prepared by:



Mark Molyneux
National Fleet Performance Manager
Rail Delivery Group

Authorised by:

Peter Williams
Fleet & Performance Data Manager, Avanti West Coast and Chair of 701A Owners Group

Contents

1 Purpose and Introduction

1.1 Purpose

This Guidance Note describes and outlines good practice that organisations should consider when trying to assess the performance of their depots, yards, or sidings and whilst considering related performance improvement initiatives.

This document has been created based on discussions and presentations at the industry 701A-Owners Group. Where specific examples of good practice have been identified these are presented (Good Practice Examples) to illustrate the point.

Similarly, where specific examples of bad experience or significant learning points have been reported these are also presented (Learning Points) to illustrate the point - to make organisations aware of the potential pitfalls.

In addition, Appendix B lists freely available industry documents where additional depot related guidance can be found.

1.2 Introduction

Depots, Yards and Sidings (DYS) are crucial to the success of our railway. Despite this, they can be considered to have been the 'Cinderella' of the railway for decades in that they are not at the top of the list in relation to strategic investment.

Learning Point:	*As part of the Trans Pennine Route Upgrade the Electrification requirement at Neville Hill Depot was originally not part of the plan. However, funding has subsequently been secured for feasibility work which will hopefully show that the proposals for more electrification of the depot and another entry and exit road are beneficial and achievable since it does not make sense to electrify a route and not simultaneously improve the facilities on that route.*

Consequently, depot culture is 'to try get on with it' and external events effectively mean that things are often 'foisted' on depots. This was illustrated by the Rail Accident Investigation Branch (RAIB) report into the tragic driver fatality in 2019 that identified that Tyseley depot was operating at 'over' capacity and added that fleet cascades and new train projects are rarely supported by the money to deliver the new facilities that are often necessary.

Organisations are therefore aware that depot facilities are not big enough, but despite this TOCs continue to attempt to deliver the daily service. It really should not be like that, but this is the unfortunate reality for many depot operations.

Depots are also not immune from issues affecting the wider railway and at times of stress, since the number of depot related incidents correspondingly rises.

Learning Point:	*Govia Thameslink Railway (GTR) reported that ongoing problems with traincrew availability affected their ability to replace units that became defective in traffic*
Learning Point:	*Avanti West Coast (AWC) reported that Empty Coaching Stock (ECS) moves onto the depot are the stock moves that are subject to cancellation if there are insufficient traincrew and therefore units are typically out berthed as a result.*
Learning Point:	*AWC have experienced adhesion related issues off their Oxley depot. AWC also noted that depot acceptance minutes typically increase once the network is disrupted – which can often be exacerbated during the leaf-fall period.*
Learning Point:	*c2c experienced delays because of 'depot' drivers being 'reallocated' to other duties in support of the service.*
Learning Point:	*Great Western Railway (GWR) reported that St Phillips Marsh Depot had been both struggling with drivers and had been experiencing congestion and capacity problems. The driver problems have been related to the age profile and training up new depot drivers has generated difficulties in the 'post-COVID*

	world.'
Learning Point:	*The South Western Railway (SWR) 'Desiro Classic' Class 444/450 units in Autumn experienced lots of trains out of service because of low sand levels – as a result of accepted deficiencies with SWR's sand management processes.*
Learning Point:	*During the 'pingdemic[1]' which contributed to driver shortages and depot team shortages, GWR required lots of set swaps which resulted in availability problems because the units were not in the required place to repair.*

[1] The term 'pingdemic' was coined from 'pings' delivered by the NHS COVID app during 2020 to notify users when they had come into contact with someone who had tested positive for COVID-19. The NHS COVID app then issued a message urging them to quarantine from home for ten days – thereby preventing them attending their workplace. This significantly affected railway staff availability at the time.

2 Understanding Depots, Yards and Sidings Performance

2.1 Pre-requisites for understanding Depots, Yards and Sidings Performance

To really understand what is driving Depots, Yards and Sidings (DYS) performance there are a few pre-requisites that need to be in place, namely:

1. Specific TRUST Responsible Manager Codes for each DYS.
2. Effective processes in place to record arrival and departure times at all DYS.
3. Effective processes in place to record the reasons for any late departures or arrivals at each DYS.
4. Consistent application of the industry agreed guidance in relation to delay attribution. e.g. Delay Attribution Principles and Rules (DAPR) and the RDG Twenty Point Plan (20pp).
5. A nominated owner of 701A performance across the organisation who is empowered to deliver continuous improvement.
6. All planned movements onto and off DYS should be timetabled – including Empty Coaching Stock (ECS) moves.

In the above statements the word 'effective' denotes that the processes are integrated across an organisation's business i.e. location performance data is available to the wider business as opposed to solely at each specific location.

Learning Point:	*Transport for Wales Rail (TfWR) do not think that 'fleet are very effective at disputing minutes related to depot operations'*
Learning Point:	*There is currently a disconnect between 'on' and 'off' network performance. This can only be addressed by Empty Coaching Stock (ECS) moves being treated with the same rigour as passenger trains.*
Learning Point:	*Within AWC 'Class 5 (non-passenger ECS) delay minutes' are considered of lesser value and this results in it being very difficult to ascertain the root causes of delay.*
Learning Point:	*It has been highlighted that most depot late starts are allocated to the 'OU' coded pot – 'Uninvestigated' which is created by the Delay Attribution teams every day. It is further estimated that 9 out of 10 of these delays are therefore not investigated any further.*
Learning Point:	*Greater Anglia (GA) discovered that the Ilford Depot Responsible Manager Code was being used as a 'general depot pot' and had no clarity of who was using it and why. There was a factor of 10 ratio between primary and secondary delay – which was the real 'killer' in terms of impact to the wider GA business.*
Learning Point:	*TfWR reported that MHLG is used for incidents that are ultimately No Fault Found and added that the primary focus is on MTIN as opposed to 701A non-technical performance and added that the average delay is only 9 minutes associated with 701A and it can therefore effectively pass 'under the radar' in terms of performance focus.*

Good Practice Example	*Northern identified that the link between Leeds Station and Neville Hill Depot was crucial to good performance on the route. Using data to understand how depot departures clashed with trains on the wider network identified that if trains were 'interposed' 3 minutes before they were due to depart – as opposed to when the train was ready - then the delay across the network was minimised.*

2.2 Depot Rules

For each DYS, 'Depot Rules' should be developed that define the parameters for each location that need to be complied with for the specific DYS to be able to correctly function i.e. this defines what the train plan needs to deliver.

Amongst other parameters, this will define at a working level:

1. The number of units (or vehicles) that can be accommodated i.e. the Maximum depot capacity –

both for maintenance, servicing and stabling.
2. A set of standard arrivals and departures with correct associated TRUST timings for different train formations.
3. Realistic i.e. achievable headways between arrivals for servicing.
4. Maintenance downtime requirements (quantum, duration) and the 'touch time' needed to carry out the necessary tanking, fuelling, other servicing, or maintenance (planned departure and arrival times need to reflect these requirements) – which also needs to incorporate the timings to shunt vehicles around to get them in the correct position to undertake the required servicing or maintenance.
5. Any third-party Train Supply Agreements e.g. contractual requirements.
6. Any driver resourcing requirements on an hour-by-hour basis – which also needs to incorporate the timings for 'train preparation'.
7. Constraints regarding entry/exit headways.
8. Any notable changes between shifts/days/nights.
9. Associated constraints in terms of number of entry and exit points on the depot.
10. The provision of several empty roads required to both accept defective trains from service and the continuing need to be able to shunt trains around the depot.
11. For depots that do not open 24hrs – depot opening times need to be documented.

A proposed document structure for the 'Depot Rules' is presented in Appendix A: Suggested 'Depot Rules' Document Structure.

The 'Depot Rules' should form the bedrock of the train plan. It is the intention that they will generate a clear checklist for the train planners – whereby (much like the Network Rail (NR) /Timetable rules) if they cannot comply with any of these rules, there is a need to highlight these non-compliances with the Fleet Engineering Team and apply for a 'concession' to obtain agreement. This will facilitate the relevant discussions to take place to implement changes elsewhere in the plan which will facilitate the concession, or other mitigations to be worked up and/or funded. This also needs to cover Short-Term Planning / Engineering Work amendments.

Learning Point:	*Northern's Neville Hill Depot discovered that whilst their Timetable Planning Rules were set at 3 minutes for train departures, long trains were found to take 4 minutes.*
Learning Point:	*London North Eastern Railway (LNER) identified that berthing stop positions were generating delays – since it was found that in one location the trigger point was half-way down a wash road.*

Good Practice Example	*GA have undertaken a lot of work at Ilford to develop a set of 'Depot Rules' that are based on capacity. At the highest level they:* • *Worked with the depot planners* • *Determined that three running roads are needed to be left empty to shunt trains – otherwise the depot cannot function.* • *Should this capacity get used no further trains will be accepted into the depot and Control must find alternative berthing locations.* • *Reported that this has not been an 'easy win' and there is unfortunately no quick fix.* • *Found that they have had to 'stick to their guns' and in the early days trains have been left waiting on the signal – simply to reiterate the message that the depot was indeed 'full'*
Good Practice Example	*Trans Pennine Express'(TPE) recent fleet transformation threw up many depot related issues and rewrote their 'Depot Rules Document' for the December 2020 Timetable.*
Good Practice Example	*ScotRail reported the following initiatives:* *Whilst they do not currently have any big issues with 701A performance, they are working with the other Abellio TOCs to develop 'Rules of the Depot' focussing initially on Haymarket Depot in relation to the HST introduction. The Rules of the Depot includes:* • *Turnaround times for tanking and servicing* • *Sufficient time gaps between arrivals and departures* • *Preparation time*

	ScotRail are rolling this out to other depots and are drawing it up for Inverness next and commented that the biggest challenge to get everyone aligned (train planners and depots) but it has been successful in bringing people together and breaking them out of their 'silos'. The December 2021 Timetable came out for review with some changes made concerning the depots fuel point turnarounds.
Good Practice Example	*c2c have developed 'Depot Rules' that include:* • *Realistic timings of arrivals/departures of different train formations. This was done to ensure delays aren't picked up on the adjacent network* • *Realistic stabling capacities for the number of units at each location*
Good Practice Example	*c2c have a policy where new drivers spend 6-8 months learning how to drive around the depot before going on the mainline.*

It could be the case that dealing with the routine workload is the priority in that there is enough staff available and space to accommodate (and move into position for maintenance) the timetabled trains. This could be taken further in that it is made clear that nothing additional should be attempted to be moved to depots between the hours of XX:XX and YY:YY to ensure the routine requirements are met without interruption.

Most Fleet non-technical incidents are because of problems with availability and the Timetable. The Timetable can only be improved if it its development is supported by good 'Depot Rules' – since until depot requirements are clearly articulated to the Timetable planners the industry will not solve this.

Typically, there are many more staff focussed on addressing technical issues, with much fewer staff focussed on the non-technical issues.

2.3 Depot Capacities

As an industry, depot capacities are not known – since this is a complex area.

The typical depot culture is 'to try get on with it' and external events effectively mean that things are 'foisted' on depots. Organisations are aware that depot facilities are not big enough, but despite this TOCs simply must continue to attempt to deliver the daily service.

The demands placed on a depot are often changing in terms of train types, Timetable and fleet reliability.

Learning Point:	*The RAIB report into the tragic driver fatality at Tyseley in 2019 that identified that the depot was operating at 'over' capacity and added that fleet cascades and new train projects are rarely supported by the money to deliver the new facilities that are often necessary.*
Learning Point:	*TfWR experienced major capacity issues at their Cardiff Canton Depot because of their new fleets testing and commissioning programmes e.g. Class 769 taking up space. TfWR believe that they do have a set of rules that train planning use, but they are less restricted at Cardiff Canton Depot since there are four routes onto and off the depot, although only two are of real use. The issues they do experience are typically the positioning of units to form the service.*
Learning Point:	*Following concerns that 'too many trains' were being routed into Neville Hill Depot, a review was undertaken by all affected TOCs. This resulted in temporary CET facilities being added to the reception roads to facilitate throughput.*

A completely full depot is of no use to anyone and that depots can be effectively 'full' when 70% of the sidings are occupied – and depending upon layout that could be much less.

A depot simply cannot operate at 100% capacity and the 'maximum' that a depot can operate is not necessarily optimum – since there needs to be a level of contingency factored into things to deal with the 'unexpected' things that inevitably happen whilst running a railway.

In addition, it's also not only the whole depot that could be a constraint:

Learning Point:	*At Tyseley depot the fuel point capacity is a constraint on the overall depot*

	capacity.
Learning Point:	*Headways off Tyseley depot also do not align with the adjacent network junctions and West Midlands Trains (WMT) can effectively take up the depot capacity – without any additional CrossCountry arrivals.*

Good Practice Example	*Northern has developed a depot capability plan for Heaton and found that Neville Hill was overly congested and as a result Northern do not send as many trains there and they are actively monitoring the number of units returning there to ensure that they can cope.*
Good Practice Example	*GA have got to the point where they now fully understand depot capacity at Ilford which is important to understand performance.*
Good Practice Example	*AWC are drilling down into the detail in terms of depot performance and the analysis had revealed a lot of depot 'acceptance' incidents at Longsight – which is a really busy depot and does not have the best layout. Conversely their Edge Hill depot has lots of issues getting trains out of the depot due to adverse signals on the mainline.*
Good Practice Example	*At c2c depots, the fouling points are physically identified to prevent trains being left in the wrong place. This has been achieved by working closely with their Operations colleagues.*
Good Practice Example	*GA are constructing a 'digital twin' of Ilford Depot to model future capacity requirements of the depot.*

Depots are a system of systems which can be simulated in a modelling environment.

Depots can be considered as having two capacities a 'static' capacity and a 'dynamic' capacity and this can be visualised using an analogy of a completely full glass of water.

The completely full glass of water represents the 'static' capacity of a depot i.e. a completely full depot.

Once you start to move the glass around some water will spill out and the more quickly you move the glass around the more water will spill – which is analogous to representing the 'dynamic' capacity of the depot.

The 'dynamic' capacity of the depot would therefore always be less than the 'static' capacity and the eventual dynamic capacity is related to how 'busy' the depot is in terms of activity.

Good Practice Example	*Consultancy Frazer-Nash Consultancy (FNC) have developed a bespoke tool that analyses depot performance. For the model to function the following parameters are required:* *To determine static capacity:* • *Fleet size* • *Maintenance requirements* • *Number of depot roads* *To determine dynamic capacity:* • *Stock types* • *Stock formations* • *Timetable* • *Depot layout – noting that the orientation of switches and crossings have a strong influence* • *Staffing* *In terms of output, the model will generate:* • *Depot utilisation* • *Timetable adherence – overall input / output adherence to the plan* • *Fleet Depot movements analysis* • *Staff utilisation* • *Road / Fleet / Person Activity* • *Dynamic capacity of a depot* *The system boundary is the depot connection with the mainline.* *The tool can provide a more realistic view of how a depot will function, be it a newly proposed depot, or an existing depot in relation to a revised Timetable.*

	Since the tool can analyse thousands of parameters, to optimise the operation of a depot it provides a cost-effective analysis of proposed changes to existing depots. *The model identifies when the depot will 'break' if you try to do too much.* *The tool can model different scenarios e.g. the effect on the depot of proposed changes to the Timetable.*
Good Practice Example	*East Midlands Railway (EMR) have many 'committed obligations' in relation to their latest franchise agreement and found themselves trying to deal with too many 'what-if' scenarios. EMR have employed the FNC tool (described above) that analysed proposed changes to their Etches Park Depot in readiness to the arrival of their new 'Aurora' fleet of trains. It was found that Etches Park could only handle a specific number of 'coupled unit' departures from the depot.* *It took EMR between March and September to obtain the necessary output, but that was mainly related to the difficulty obtaining the necessary data for the new fleet of trains such as estimating the number of casualty repairs that would be required etc.*

Accurate capacity modelling is key to ensuring depots can continue to operate e.g. at times of fleet transition (refer to Section 3 New Train Projects / Fleet Cascades (Significant Change Management)).

A theoretical exercise can be undertaken in terms of understanding the maximum capacity of sidings, accepting that trains still need to be moved around for washing and Controlled Emission Toilet (CET) emptying etc.

The theoretical capacity is to have enough room to expect a failure with a spare road available to accept a failed service train. In addition, a spare run around road is also required.

Good Practice Example	*It is c2c policy that both the wash road and CET road left are empty at East Ham Depot.*
Good Practice Example	*Northern depots use working capacity numbers and send a report out each afternoon to manage their workload and flag up if there are more units at (or planned to be at) a location than the stated working capacity. If the capacity is exceeded a red flag is issued and work arounds are initiated.*
Good Practice Example	*AWC produce a report every Thursday from the depot planners and internal fleet managers to identify if they are over capacity and flag it to control to put mitigation in place.*
Good Practice Example	*Chiltern Control send out a sheet every day which calculates the depot capacities based on the number of expected arrivals and other pieces of information. They do accept that this can never be exact – since the number of spare vehicles at a site can be unpredictable – as you cannot say for definite which vehicles will be repaired.*
Good Practice Example	*GA have an in-house capability to undertake depot capacity modelling that can identify any pinch-points.*

Whilst the working capacity of DYS can change because of infrastructure availability, experience has shown that this doesn't change much.

It is important for depots to regularly communicate to Control and that temporary overcapacity at depots can be dealt with, but that this is not sustainable in the long-term.

It is very important to plan for maximising the use of the sidings since 6-cars berthed in 8-car sidings has an immediate adverse effect on available capacity – which in turn is linked to the train plan.

2.4 Depot Operating Policies

It is very difficult to specify national depot operating procedures – since all locations have their local differences and peculiarities.

Learning Point:	*GA highlighted the significant differences in operating procedures e.g. at Ilford Depot staff move the points, whereas at Old Oak Common it is down to the depot drivers to move the points. If not enough time is factored in for the staff*

	to move the points these variables can skew the figures. It is what is going on at the local level that needs to be understood.
Learning Point:	*There is also a real need to better understand movements around a depot location – since typically this data is currently not available.*
Learning Point:	*Since each Depot has their local constraints a typical ratio for depot static capacity : dynamic capacity is not possible to be estimated.*
Learning Point:	*AWC's Edge Hill Depot needs the surrounding signals to be non-restrictive to maintain performance. Signal sighting has historically been a problem and the timings of depot departures are being reviewed. However, there is a need to look at the end-to-end process before any changes are made.*

Whilst the previous statement is true, there does remain scope to determine headline depot operating policies.

Good Practice Example	*c2c have evolved their 'Depot Rules' to include details of how the depots function. These included:* • *Absolutely no propelling moves are allowed.* • *Only one move is permitted at once at a location.* • *Since the sidings are all manual operated points, trains do not stop over Switches and Crossings (S&C) – and also trains do not 'trail' through S&C.*
Good Practice Example	*Moves around Northern's Neville Hill Depot and EMR's Etches Park Depot were modelled using 'Lego' bricks on a table.*
Good Practice Example	*GA host on site depot working groups with all organisations at the depot e.g. TOCs; 3rd party maintainers; NR and added that this holistic approach had facilitated a detailed understanding of the constraints which includes having to cross electric main lines in order to access some of the stabling sidings.*
Good Practice Example	*GA and MTR Elizabeth Line (MTREL) have a weekly meeting to close out any issues. It is the general idea that issues are dealt with there and then – in order to 'nip them in the bud'*
Good Practice Example	*GTR undertook an RM3P assessment at their Hornsey Depot*
Good Practice Example	*GTR implemented a fleet control reorganisation where planners and 'phone a friend' have been split between teams to focus on both. (Previously they all rotated through the desks). It was noticed that fault finding support subsequently improved.*
Good Practice Example	*Historically at TFWR's Canton Depot only had one Operations Team Leader whose responsibilities included controlling shunt moves and managing the team of shunters. It was evident that this was a lot to manage considering that there is a train departure every 6 minutes for three hours at the start of the day. In order to improve the situation an additional Operations Team Leader was appointed between Sunday and Friday and their responsibilities were split with one conducting the movements with the assistance of the shunters and the 2nd Operations Team leader liaising with the drivers for the afternoon service – essentially ensuring that the drivers are there when needed.*
Good Practice Example	*Prior to the pandemic there was a regular TfWR meeting between 'Fleet' and Operations' – known locally as the FLOPS meeting. The meeting includes Driver Managers, Conductor Managers and Fleet representatives – and this meeting has now resumed. One of the immediate issues identified from this meeting was that one driver's turn was overloaded in terms of the number of train preparations that they were required to undertake – so a more balanced approach to this has been implemented – to share the workload around.*
Good Practice Example	*AWC have a good interface between their Fleet and Operations teams as a result of a weekly driver call. A recent issue that has been dealt with has been in relation to the 'parking' position of the windscreen wipers – which was dealt with effectively before it became a 'big issue'*
Good Practice Example	*AWC's Longsight Depot has been found to experience a lot of acceptance delays. This has been addressed by trying to ensure that they arrive 'right time' and they have been liaising with their station teams to focus upon a right time despatch. This has achieved better right time performance and it has also affected other trains on depot.*
Good Practice Example	*In order to simplify the operation of Neville Hill, Northern took over as the exclusive Depot Facility Owner and staff from EMR were subject to TUPE.*

3 New Train Projects / Fleet Cascades (Significant Change Management)

3.1 Background

New Train Projects are not just about the trains, since they need to holistically encompass the depots and supporting maintenance arrangements as well.

All too often, new train projects and fleet cascades have not considered the real implications for the affected depot in order to effectively manage, service and maintain the new fleets.

3.2 Fleet and Depot Requirements

Even where depot requirements are effectively addressed, the fact that infrastructure works will typically need to be undertaken at a live maintenance location (in order to keep the existing fleets maintained) can cause significant disruption – since some depot facilities will be out of use whilst these are being upgraded and therefore will be only able to operate at reduced capacity. This upheaval needs to be effectively planned for.

Nobody wants to be building a depot while a new fleet is being delivered – but events typically conspire so that this happens all too frequently.

Learning Point:	*GA reported that Norwich Crown Point Depot had been a 'building site' and performance had been poor as a consequence of previous decisions (with good intentions) made by the organisation 18 months prior. It was therefore no surprise to them to see the associated Responsible Manager Code (MBEX) in the top 20 at that time.*

Depots are also placed under their maximum stress in terms of capacity whilst fleet transitions are being undertaken – since the new trains are being introduced the replacement trains need to be stabled and ultimately transferred to their new operator – or scrapped if they are at end of life.

Learning Point:	*The RAIB report into the tragic driver fatality in 2019 identified that Tyseley Depot was operating at 'over' capacity, but added that fleet cascades and new train projects are rarely supported by the money to deliver the new facilities that are often necessary*
Learning Point:	*A recent New Train project procured the trains without an associated maintenance support agreement. This led to a sub-optimal maintenance arrangements being subsequently agreed and was considered to be less than ideal.*
Learning Point:	*From late 2017, GWR's HST fleet was being replaced by the Super-Express Trains (SET) as part of the Intercity Express Programme (IEP). The SETs were to be serviced at both Laira and Long Rock. However, the Timetable had a 9-car SET being serviced at Long Rock, but the problem was that a 9-Car could not be accommodated at the depot and therefore the depot was effectively grid-locked whist the 9-Car sat on the reception road. There were further complications as a result of having to manage third parties in relation to the maintenance arrangements.*
Learning Point:	*Northern found that managing the additional maintenance requirements of the toilets on the new trains had been a massive issue following service introduction – since it has been found that there is simply not enough space to accommodate at that time on their network. They had to look at where tanking could happen and also looked at 3rd party locations and other options involving with NR and other TOCs.*
Learning Point:	*Northern found that their existing fuelling and tanking installations were not compatible with their new trains in relation to the existing lengths of pipes and*

	they were forced to 'selectively fuel and tank'. Trains were running out of water faster than they were of fuel, but for whatever the reason the tanks are not meeting the demand. It is suspected that this might be because people are washing their hands much more often than before the pandemic.
Learning Point:	*For the TfWR Class 175 fleet, Chester was the 'maintainers hub/centre of excellence' and therefore defective trains are often sent to Chester for repair – which creates problems the next day in terms of unit availability elsewhere.*
Learning Point:	*EMR have lots of diverse depots and from May 2021 took on Kettering stabling point - which is novel to EMR in that it is 25kV ac OLE electrified.*
Learning Point:	*TfWR found that technical and non-technical fleet performance was deteriorating with their Class 175 fleet as the maintenance contract with Alstom came to an end and was replaced by CAF.*
Learning Point:	*The bodyshell cracking issue that emerged during 2021 on the Class 80X fleet impacted LNER's operation at the time. Whilst MkIV sets were reintroduced to cover, this resulted in a compressed ramp up of activities from a new depot location with new maintenance staff.*

Good Practice Example:	*Prior to the introduction of their new Class 720 trains (and associated fleet cascade), GA undertook detailed capacity modelling at their Ilford Depot. This identified a number of pinch points months in advance and were able to put in place mitigations, re-run the capacity models and show that the proposed mitigations provided the headroom needed.*
Good Practice Example:	*For their new train fleet, c2c commissioned a study by an external company to simulate arrivals/departures to identify any clashes on their depots and sidings. A few were identified and these were fed back to the Timetable planners.*
Good Practice Example:	*EMR spent a great deal of time 'unpicking' the proposed diagrams over the Christmas 2021 period – since they were found to be unworkable. EMR's aim was to free up some depot capacity to facilitate fleet cascade.*
Good Practice Example:	*GA looked at a capacity model for Ilford and other depots – since there needed to be contingency plans developed to manage the transition of their fleets whilst their new stock was being delivered.*

New Train contracts are also contributory to generating non-technical fleet related problems.

Learning Point:	*The TfWR Class 175 fleet consists of 2-Car and 3-Car units. However, according to their contract it does not differentiate between 2-Car and 3-Car units – so should Alstom make a 2-Car available for a 3-Car diagram then there is no penalty, despite the resulting problems from operating a short-formed train in service.*
Learning Point:	*TfWR performance has been adversely affected by a change of Third-Party Maintainer heralded by the arrival of a new fleet of trains. It has been described as a 'messy divorce' and there is very little 'goodwill' left between the organisations.*
Learning Point:	*Northern found that the additional stock moves were required to manage Controlled Emission Toilets fitted to their new fleets of trains*
Learning Point:	*TfWR reported that the ongoing problems with their Class 769 fleet has created many depot swap overs*

3.3 Managing Third-Party Maintainers

TOCs are increasingly reliant on third-party maintainers and contractual Train Service Agreements to provide the trains to operate their services. Often, the third-party maintainers are isolated from the running railway and as a consequence their depot teams potentially do not fully appreciate the 'wider picture' in terms of TOC operations and the human factors aspects.

TOCs often grapple with the problem of how to effectively engage with these organisations. This is further compounded by the fact that often the TOC remains the 'Depot Facility Owner' at their sites – and therefore future engagement and any tangible associated benefits are dependent upon the supporting contractual arrangements.

Learning Point: / Good Practice Example	*Neville Hill previously had two Depot Facility Operators, namely Northern and East Midlands Railway shared responsibility. LNER and Hitachi also use the site. Northern have now taken over as the single DFO – which has simplified arrangements at the site.*

The wording of contracts can drive the behaviours of third-party maintainers that only focus on issues affecting headline fleet reliability e.g. MTIN such that Class 5 (non-passenger ECS) delays do not get any attention.

The fact remains that there is a need to collectively find a way to make people accountable for their delays. Whilst the supplier and customer might not be able to agree root cause, it does not change the fact that such delays happen. The operator will still 'take the hit' but as a result of current contractual limitations the operator does not have an effective mechanism to direct their supplier.

Learning Point:	*CrossCountry have no contractual mechanism to penalise or incentivise their third-party maintainer (Alstom - formerly Bombardier) in relation to 701A incidents. They therefore have to have a partnership approach in the absence of any 'carrots or sticks'*
Learning Point:	*LNER have inherited the Master Availability and Reliability Agreement (MARA) and Train Availability and Reliability Agreement (TARA) which is the source of much frustration since it does not necessarily represent the needs of the TOC today and is quite inflexible for planners to diagram against. The ECM entity is also stated as Hitachi rather than the Duty Holder, i.e. LNER.*
Learning Point:	*Trans Pennine Express operate small fleets and since they do not own any depots they are never a priority for any depot.*
Learning Point:	*LNER experience problems obtaining the paper Fitness to Run Certificates from their maintainer (Hitachi) in a timely manner. A digital handover process is being developed.*
Learning Point:	*TfWR reported that an Alstom refurbishment that had been undertaken on the Class 175 units in the past 12-18 months which had left TfWR short on trains which had been covered by Class 158 units.*
Learning Point:	*For TfWR a large proportion of 701A incidents were generated as a result of trains not keeping to time as a result of incorrect train formation e.g. Class 150s allocated to cover Class 175 diagram (slower speed unit) or a short formation had been provided e.g. 2-Car on 3-Car service. When one of the 3-Car sets is on the programme this has been typically covered by a 2-Car set (or even a 150 or 153). Alstom maintain the fleet under a Train Service Agreement. Within the Contract there is no performance regime around mis-formation of trains with the exception of trains that start at Chester. Only 7 or 8 trains start from Chester - so the majority of trains are not covered by this regime.*
Learning Point:	*For TfWR Chester is the 'maintainers hub/centre of excellence' and therefore defective trains are often sent to Chester for repair – which creates problems the next day in terms of unit availability elsewhere. Whilst TfWR do have outstation staff, typically units return to the Alstom depot to repair – since that is what TfWR expect from the contract.*
Learning Point:	*AWC's fleet are maintained at five depots that are managed by Alstom, but they are not exclusively for the use of AWC i.e. these depots are shared with other operators*
Learning Point:	*An aspect that affects the ability of TfWR to deal effectively with incidents is the fact that their Cross-Borders Network (north-south Wales) consists of long routes with only one depot which creates a lot of complexity in returning units back to depot.*
Learning Point:	*Arriva Rail London reported that a possible reason for an increase in incidents related to Willesden Depot was a lack of engagement with their train service supplier Alstom in terms of driving these incidents down, but that said, there is currently little impact on passenger service of these incidents.*
Learning Point:	*GWR employ a 'Hitachi Management Code' for incidents that GWR and their maintainer Hitachi cannot agree upon the 'root cause'. There is a separate team dealing with this aspect of GWR's contract and as a consequence it is not clear how Delay Attribution is being dealt with in relation to this Fleet to those outside that team at GWR.*

Good Practice Example	*CrossCountry has a wealth of experience dealing with third-party maintainers and they have a specific programme to educate their suppliers and maintainers in relation to explaining their business. Furthermore, they encourage people from their third-party depots to get into XC's driver's cabs to widen their understanding of their role and to simply experience a train at high speed e.g. 125mph. This has been beneficial in terms of improved maintenance practices and additional benefit to this initiative has been to improve collaboration with not only their Ops team, but also the CrossCountry drivers. They were also rolling this process out to include their RosCos and had included a 360º feedback session in relation to their contracts.*
Good Practice Example	*AWC concluded that in order to effectively manage depot performance some good measures are required e.g. timing points reflective of depot departure; measure of drivers prep timings.*
Good Practice Example	*CrossCountry have a mature relationship with their maintainer and as a result they have reported that the contract has never got in the way of collaborative working with their supplier Alstom (formerly Bombardier).*
Good Practice Example	*GA have an agreement that they will have 45 minutes post maintenance in order to ready the trains for service. It is therefore important that they keep a log of the time of handover following maintenance. This is a key lever they have in order to manage their supplier relationship.*

4 Timetabling

4.1 Background

It is accepted that the purpose of a depot is to provide safe and reliable trains to operate the published Timetable. However, sometimes not all of the respective depot requirements e.g. the needs of the fleet maintainers to be able to meet this need are incorporated into the Timetable plan – and therefore effectively the depot is being set up to fail at the outset.

The Timetable needs to work for all DYS.

4.2 Link to 'Depot Rules'

As stated in the earlier section (2.2 Depot Rules) the associated 'Depot Rules' should list the requirements needed for the depot to function - since it is a fact that train planners are very good at adhering to NR's Rules of the Plan and it would be very helpful for all concerned for depots to develop and share a clear set of depot rules for train planners to follow'

It is hypothesized that the absence of such a set of 'Depot Rules' has created the opportunity for train planners to keep pushing the 'boundaries' of acceptability in terms of train diagramming.

It is the intention that the 'Depot Rules' are shared with the Timetable planners to make the Timetable fit for the maintainers' requirements.

Where it is not possible for the Timetable to comply with the Depot Rules, this is flagged by the Timetable planners to the maintainers in sufficient time for other mitigations to be developed, agreed and implemented prior to Timetable implementation.

Good Practice Example	*Northern's depot working capacity report is also used by train planning for Timetable Development purposes.*

It is therefore the aspiration that a clear 'Depot Rules' is produced that is on a par with 'Rules of the Plan' and planners should only be able to deviate from the agreed 'Depot Rules' by following a formal dispensation process.

The secret to success in relation to Depot Performance is that the base train plan (if delivered) generates no delay.

It is therefore essential that depot teams establish a 2-way dialogue with train planners, but this is a real challenge facing the industry since the local issues need to be highlighted to the centralised Network Rail Timetable 'hub' in Milton Keynes and there is therefore a need to engage at a national level with Network Rail.

Often it has been found that there have been difficulties in relation to agreeing timescales for Timetable development – and sticking to them. This was particularly the case during the COVID-19 Pandemic when TOCs were subject to many Timetable changes in that the operator was changing their Timetable almost weekly to match capacity with demand - approximately nine Timetables in 6-months.

Learning Point:	*LNER found that a Timetable had resulted in a maintenance 'touch time' for their third-party maintainer, Hitachi at Neville Hill Depot of only three hours. This had been further exacerbated by the fact that there was nowhere vacant on the depot to stable a 9-Car IEP without returning to the reception road – thereby limiting access for long trains onto the depot.*
Learning Point:	*GWR's HST fleet had been replaced by the Super-Express Trains (SET) as part of the Intercity Express Programme (IEP). The SETs were to be serviced at both Laira and Long Rock. However, the Timetable had a 9-car SET being serviced at Long Rock, but the problem was that a 9-Car could not be accommodated at the depot and therefore the depot is grid-locked whist the 9-Car sits on the reception road. There are further complications as a result of having to manage third parties in relation to the maintenance arrangements.*

Learning Point:	*TfWR have been subject to a lot of vehicle cascades and the Class 769 has introduced a lot of problems – in the main technical, but some were operational. TfWR have had a new Timetable that has introduced new diagrams that has required an additional fuelling installation at Rhymney since the Class 769 range is not sufficient.*
Learning Point:	*In 2018, ScotRail took on some of the cascaded HST fleet, but the timetabling process had not considered the supporting depot or crewing requirements and it was found that they could not operate the published Timetable.*
Learning Point:	*LNER attempted to berth three units at Neville Hill between 2130-2200 and it was found that there was insufficient time to achieve this.*
Learning Point:	*AWC discovered that a recent Timetable change had made set swaps more difficult.*
Learning Point:	*TfWR identified that some of their unit diagrams are 18/19-hour duration with very few returning to the maintenance depot which has led to diesel engine reliability issues.*
Learning Point:	*Northern reported that sometimes the diagrams do not facilitate the requirements of the depots to be met in terms of units returning to depot for maintenance and that a lot of time and effort can be expended investigating the reason for set swaps and added that only 20-30% of the Northern fleet returns to the depot each day.*
Learning Point:	*ScotRail's 'MHA' codes reflect the 'Control' of the fleets nominally based at Corkerhill (MHAC) and Inverness (MHAI) which due to the geography of the ScotRail operation typically need lots of set swaps to return these trains to the home depot. The Haymarket maintained trains are covered by MHAH.*
Learning Point:	*TfWR experienced numerous late notices of units required for maintenance and toilets in need of tanking/emptying. This requires lots of stock changes to facilitate this. The fundamental reason for this is that the train is simply not really designed for the diagrams currently being operated.*
Learning Point:	*Southeastern have identified that getting stock back to Ramsgate Depot is more difficult on their bigger fleets. Class 375 units are interchangeable, but Class 376 units need specific diagrams.*

Good Practice Example	*For their new train fleet, c2c commissioned a study by an external company to simulate arrivals/departures to identify any clashes on their depots and sidings. A few were identified and these were fed back to the Timetable planners.*
Good Practice Example	*Chiltern recalculated depot capacities and this has been added to their 'Compendium of Train Operations'. It was identified that there were too many arrivals at Banbury Depot for the depot driver to effectively deal with so the train plan has been amended and stock is out berthed to free up depot capacity. COVID has undoubtedly helped in reducing the train plan. It has also helped in improving relationships with train planning. Fleet /Train Planning now have a weekly meeting which has really helped to smooth out the relationships.*
Good Practice Example	*Northern's Heaton Depot has four different TOCs accessing the site and that they are managing only three minutes between departures and arrivals with only one depot access/egress road. These depot constraints are fed back to the planners and the implications of compressed headways.*
Good Practice Example	*Many TOC delays are as a result of difficulties getting stock back to the depot. In order to address this a number of TOCs have shunt moves booked into their Timetables*
Good Practice Example	*GA have ceased undertaking 'VSTP' stock movements back to their depots and have migrated to using 'Q-paths'. In addition, they have implemented a 'unit return tracker' process that identified trains required to be returned to maintenance locations. This list includes only units that the maintenance locations could repair in the next 24 hours e.g. spares and resources were available. Importantly, trains that failed in service were moved to the nearest stabling point – as opposed to being automatically returned to the depots. This freed up capacity in the depots to be able to focus on trains that they are able to fix – as opposed to the depots becoming 'train parks.'*
Good Practice Example	*Northern reported that it has historically been difficult to influence the Timetable, but better maintenance slots are being delivered by working with the train planners e.g. there were originally no maintenance slots available back at Neville Hill around 8pm, but slots are now available.*
Good	*TfWR analysed train departures at Canton Depot in terms of the 'biggest hitters' in*

Practice Example	*relation to delay. Since there are two exits from Canton Depot they sent these services the 'other way'. This has allowed them to introduce 'fire breaks' of 20/30 minutes during the departures so that subsequent trains will not be affected by any earlier delay.*

5 Delay Attribution

5.1 Background

There is currently no consistent approach to measuring the performance of a depot and this also reflected in the associated Delay Attribution. One of the key aspects to understand is the context around the use of the MU code – e.g. is it being used incorrectly for maintenance induced failures? In addition, there is a 7-day critical window to undertake incident investigation – which for a number of reasons is unfortunately not always done. There are only 8 days available for the immediate delay attribution (DA)

Learning Point:	*LNER have been working with the secretary of the Delay Attribution Board since they identified that that there is no consistency in relation to when a train is considered 'on' or 'off' of the network (termed as 'replacement') – since it can be defined either when the front wheel (or the rear wheel) of the train has passed the associated signal. This is of importance in relation to train length since on average it is used to determine performance at the timing points. There are performance data accuracy codes related to 'front wheel replacement on the network' and 'rear wheel replacement off the network'*
Learning Point:	*AWC only track Class 1 and Class 9 trains in Bugle i.e. Class 5 (non-passenger ECS) trains are not shown.*
Learning Point:	*SWR had an issue at Clapham where buried power cables caught fire and caused circa 250 cancellations from trains being trapped. The TOC was held responsible even though NR were ultimately responsible and as a result the depot lease arrangements are being reviewed by SWR for off-network incidents since the current Delay Attribution arrangements hold the TOC responsible even if NR is ultimately responsible. This incident caused an increase in MU, despite NR's responsibility.*
Learning Point:	*TfWR found that whist units being damaged as a result of striking objects on the track was the responsibility NR, they created protracted delays due to the need to undertake long-distance stock moves in order to repair.*
Learning Point:	*AWC struggle to reattribute incidents to NR where signals are slow to clear.*
Learning Point:	*AWC report that late on and late off depots are a significant issue and it is acknowledged that there are performance improvements that can be made for Class 5 (non-passenger ECS) trains.*
Learning Point:	*CrossCountry report that it can be often difficult to find out the original reason for an incorrect train formation – since the reason could be several days preceding –as their trains operate between Aberdeen and Penzance*
Learning Point:	*Many TOCs do not correct the initial attribution data in TRUST and therefore the national data is not 100% correct as a result of the extra work this would entail. From the TOCs and Network Rail's perspective, the current data in TRUST is accurate at an organisational level, but in order to inform wider industry performance decisions the more granular data also needs to be correct.*
Learning Point:	*Northern reported that the industry TRUST data did not match their own data for minutes and cancellations and was significantly larger in RDG's data. This is related to the fact that the data includes ALL minutes – i.e. not just TOC-on-self, but also TOC-on-TOC minutes.*
Learning Point:	*Many TOCs do not apportion 701A codes against the fleet type.*
Learning Point:	*Chiltern's Light Maintenance Depot at Wembley has historically struggled with timings of trains for maintenance, but Aylesbury Depot has Class 1 departures and therefore does not suffer to the same extent.*
Learning Point:	*During the period when the Hitachi Class 80X bolster welds were found to be cracking LNER utilised the 701A 'MS' Code for Hitachi stock non-provision. It was not immediately clear how 'non-availability of trains' could generate so many minutes, but LNER subsequently explained that the delay minutes are so high as a result of the remaining trains in service having to fill Timetable gaps with special stop orders etc. These trains were often 5-Cars operating 9-Car diagrams and LNER had covered the Class 80X diagrams with InterCity*

	225 rolling stock that do not have the same performance as a Class 80X.
Learning Point:	*A feature of the Class 700 PIS that GTR attribute non-technical delays is related to the fact that the Passenger Information System cannot be configured for services that 'skip stations'. As a result there is a 'get me home' code that is used in these instances – since there is not a technical fault with the train – it has just not been designed to be able to cope with an operational scenario that arises from time to time, but any associated delays remain with fleet. It was suggested that such delays should be apportioned to the reason for the 'skip station' in the first place.*
Learning Point:	*AWC use a centrally managed code in relation to fleet performance. They acknowledge that there might be a benefit to split out individual depots from this centrally managed code – in order to highlight the differences to the operation.*
Learning Point:	*Northern highlighted an issue where trains that were late off depot were being attributed to MU even though they were delayed by events external to the depot. The latest issue that had been experienced were driver shortages creating congestion in the Leeds area. If the trains were presented on time at the departure signal, then these delays should have been disputed (in accordance with PGD8 Guide)*
Learning Point:	*SWR's predecessor organisation were in an alliance with NR a few years ago and it is reported that there are still elements of this culture remaining.*
Learning Point:	*During the 2021 'leaf-fall' period, SWR saw an increase in the number of 'MS' incidents as a result of replenishing sanders, together with a lack of enforcement of PGD16 with the Wessex Route.*

Whilst each TOC understands what it is doing then there is no problem at the organisational level. However, at a national level this makes comparison between TOCs of little value due to the differences in TOC application. This is further compounded by the fact that this not only relates to the TOCs, since it is reported that the NR Routes are also inconsistent in their application.

It has been suggested that late arrivals at depot cannot be mitigated by the fleet engineering teams and a national 'late arrival at depot' code would be very helpful – since it is believed that this is only tracked by some TOCs at a local level.

There is a belief in a number of TOCs that there is no way of complying with PGD16. There is a challenge to get NR to do what they should. When a stock change goes wrong the focus is on why it came out of service instead of why it went wrong (plan failure).

As highlighted earlier GTR have instigated an approach in terms of stock moves that tracks 'plan failures' within 4 hours of request – since it is sometimes difficult to reattribute on the basis of what transpired the previous day.

Good Practice Example	*SWR have identified the following six key contributing factors to ensuring effective delay attribution:* *1. <u>Culture</u>* • *Is there a shared view across the operation?* • *Is it target driven – or simply to improve performance?* • *Being target driven does not always create the right behaviours. Someone needs to own the problem and fix it otherwise it will never improve.* • *Does deep alliance with NR support or hinder things - as even through it is the right premise to reduce tension it may not always help improvement or data quality.* • *Does the DA process support the culture?* *2. <u>Process</u>* • *Does the process align with Delay Attribution Principles and Rules?* • *Does the process help support the Responsible Managers with clear expectations?* • *Is there a specific focus on timescales compliance within 8 days?* • *Is there a consequence for non-compliance within timescales?*

- *A 4-day rule is enforced in BUGLE with forced acceptance if not dealt with. This provides 2 days to dispute any incidents with NR.*
- *This process ensures a shared urgency in collecting critical evidence in the first couple of days.*
- *Is arbitration part of the normal process or is it explicitly a last resort?*
- *Does your process reference Delay Attribution Board (DAB) documents and Access Dispute Process (ADP) decisions?*

3. *<u>Timescales</u>*
   - *Is there an ultimate goal to close TIN's out within TRUST by day 8, or are Day 8 breaches accepted as normal process with subsequent code matching?*
   - *Continued management of incidents beyond Day 8 exposes data quality risks for any internal reporting or visualisation.*
   - *If the code doesn't match there is a defined process with NR to align TRUST and Bugle.*
   - *Day 1 (level 1) investigations become more important for Day 8 compliance.*
   - *Internal referrals should be carried out within the first 4 days of the incident.*
   - *Disputes to NR need to be compliant with the contractual relationship and/or local agreements.*

4. *<u>Resource</u>*
   - *Insufficient resource hampers compliance with the process.*
   - *Is the operation suitably focussed and resourced at both the Level 1 and Level 2? This could affect Day 1 accuracy of DA or longer-term management within the timescales available.*
   - *Are the functions suitably focussed and resourced as Responsible Managers to deal with the incidents effectively and robustly?*
   - *Additional contractual relationships with third party train maintainers (e.g. SIEMENS) need to be factored in.*

5. *<u>Collaboration</u>*
   - *In order to succeed a good culture and process needs to be in place. There needs to be a joint vision on improvement instead of keeping within business targets. Good collaboration with NR is also key to interface issues and associated investigations. With the disbanding of the NR Rail Vehicle Interface Engineers there needs to be new relationships set up.*
   - *Do rolling stock engineers have a direct link to their counterparts in NR infrastructure and fixed assets?*

6. *<u>Data Quality</u>*
   - *Daily/weekly reporting is adversely affected and less accurate, but period-based reporting is best.*
   - *Quality of investigations should meet the levels expected within PGD17.*
   - *Another issue could be with automated Mp701D reporting through TRUST if multiple incidents are still being managed within the process after period end.*
   - *There is no mechanism to correct TRUST and BUGLE mismatch due to day 8 breaches (may need 'Edit Set').*

Good Practice Example	*Southeastern's Delay Attribution Team sits within Engineering and as a consequence 'Fleet' numbers are much lower – as a result of having a bit more control over things e.g. in terms of traincrew.*
Good Practice Example	*The same team at AWC manage both the 701A and 701D codes and AWC's Performance Attribution Manager aligns the data contained in TRUST with that in Bugle – up to the 7-day window.*
Good Practice Example	*RDG have developed some industry guidance for TOCs that defines the criteria for the use of TRUST 701A and 701D codes. This is fully aligned with*

	the industry Delay Attribution Principles and Rules document issued by the Delay Attribution Board.
Good Practice Example	*In relation to 'set swaps' to get the trains on the 'right' diagrams there can be significant disruption as a result of such set swaps and TOCs focussing on the primary reason for the set swap has been very useful – especially in relation to incidents related to Class 5 (non-passenger ECS) trains. In terms of reattribution, if the reason for the set swap is found to be not a fleet responsibility it should be reattributed to the correct part of the business (MS is a code that should only be used for incidents that are the responsibility of fleet)*
Good Practice Example	*SWR do have a process in place that code-matches Bugle and TRUST data. It is important that the 7-day deadline for reattribution is met as far as practicable. In addition, part of their Delay Attribution Team's responsibilities and also is to align codes in Bugle and TRUST at 'day 42'*
Good Practice Example	*GTR / Southern have an 8-day focus with an 'Edit Set' code 'mop up' code match process that ensures full traceability for attribution between TRUST and Bugle data. This is illustrated by the following example:* • *There was a fault on a Class 700 operating on 25kV AC OLE that caused the pantograph to drop. The driver stated that it was a fault with the train and another member of traincrew in the rear cab reported that there was no damage to the overhead lines. The lines were checked, and the incident was split between GTR and the NR signaller.* • *Each train affected by the incident is put in the spreadsheet as well as who is responsible for each.* • *It is a long-winded process that is done for larger incidents with more disputes.* • *The report is then sent back to NR for them to amend TRUST.*
Good Practice Example	*SWR use the MU code for depot operations and that they use MS in accordance with the guidance contained in PGD16: STOCK SWAP SCENARIOS AND DELAY ALLOCATION – issued by the Delay Attribution Board. PGD16 is about generating a plan that works – which in turn is about developing relationships and teams working together e.g. dealing with previous days stock displacement.*
Good Practice Example	*In terms of the use of the 'MU' code, AWC are improving the data quality and how it is used by focussing on everything that is late 'on' and late 'off' their depots.*
Good Practice Example	*SWR's Incident Management Vision is to undertake a robust local review at the depot on 'Day 2' to decide where the incidents fit e.g. was this an 'own goal' or a known technical problem in order to satisfy themselves that effective mitigation for the problem is in place.*
Good Practice Example	*Northern have granted access to their 3rd party maintainers to BUGLE in order to support their reattribution process.*

The number of incidents is not necessarily a fair reflection of location performance – especially for multi-user sites. Taking Neville Hill Depot in Leeds as an example:

- If a Northern Train causes a delay to a subsequent LNER train departure from the depot – two incidents are created i.e. one for Northern and one for LNER.
- If a Northern Train causes a delay to a subsequent Northern departure from the depot then only one incident is created

Each operator therefore takes their own delays off depot – since Delay Attribution stops at the edge of NR managed Infrastructure.

Train Preparation is also a particularly thorny issue. This is because when trains are the subject of train preparation associated delays are allocated by who is undertaking the preparation. This is again illustrated by the following example:

- Where Engineering Staff are undertaking the train preparation and problems are experienced before the train is allocated to a service this would be allocated to MU – 701A.
- However, if Operations staff are undertaking the train preparation prior to entering service than this would be allocated to 701D.

It has therefore been suggested that a new national code for 'train preparation' would be very helpful.

5.2 Management of Stock Changes / PGD16

Irrespective of the plans in place, it is a railway truism that things change that affect the train plan. Fleet Planners are looking at more than a week ahead in terms of diagramming since the depots are set up for a controlled throughput of work. The reason a specific train needs to be changed over might not be the responsibility of fleet. e.g. a fleet planner initially puts a unit due for maintenance on a diagram that finishes at the maintenance location, but due to subsequent network disruption the unit ends up on a different diagram – thereby needing a stock change to put the unit on a revised diagram that ends up at a maintenance location.

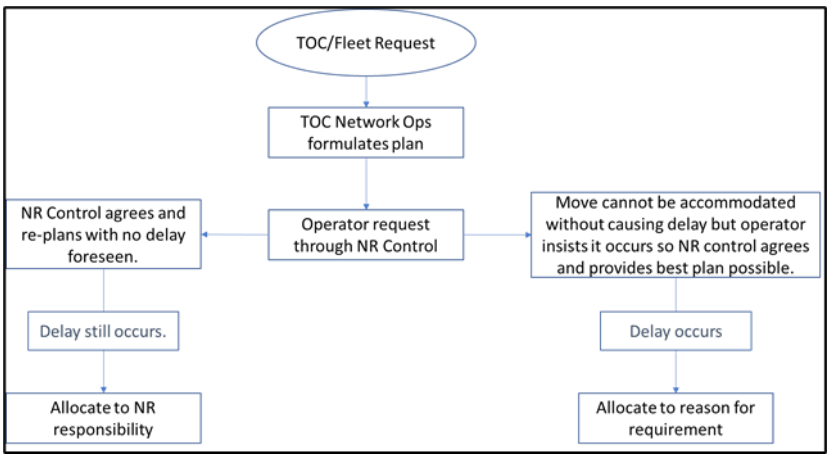
Learning Point:	*Northern report that, as currently organised, fleet is held responsible for all stock change related delays. However, there are projects under development to improve the planning of units back to depot on Northern.*

Therefore, not all requests for unplanned stock changes have 'fleet' as their root cause and it is important to understand (and describe) the root cause of the stock change. Irrespective of this, there are tensions between the Operator and Network Rail at the local level.

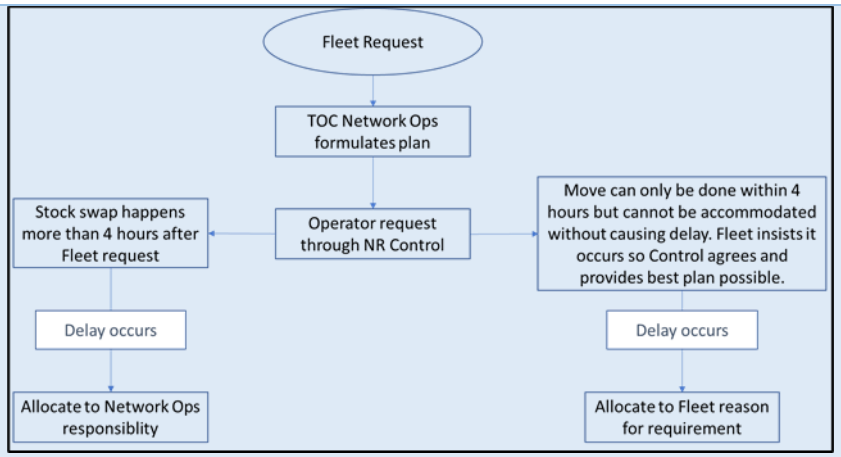
The Delay Attribution Board has published guidance Process and Guidance Document 16 (PDG16) STOCK SWAP SCENARIOS AND DELAY ALLOCATION that aims to provide greater clarity and assistance in the understanding of the attribution of delays related to Stock Swaps.

Learning Point:	*The bolster weld cracking issue that emerged during April 2022 on the Class 80X fleet impacted LNER's operation at the time. Replacement rolling stock in the form of MkIV sets had increased the number of set swaps required since there were currently insufficient trained drivers, but a subsequent training programme addressed this shortfall.*

The 'PGD16' process is shown below:



Good Practice Example	*SWR believe that if PGD16 is properly implemented it is good for highlighting the reasons the plan failed back on the 'owners'*
Good Practice Example	*GTR have enhanced PGD16 to agree at a local level a 4-hour window for the stock swap to happen – and if the 4-hour window was exceeded then any associated delay goes to GTR Network Operations, known as the 'Plan Failure within 4 hours process' which is linked to PGD-16, but enhances the arrangements in support of the discussion between the Train Planners and the technical teams.* *The GTR 'Plan Failure within 4 hours' process is shown below:*



Since the implementation of the 'Plan Failure within 4 hours process' GTR report that:

- *There is an agreed stock change plan that whilst there are still some discussions that take place, most stock swaps now happen without problem.*
- *There will always need to be some stock swaps undertaken and this method of working recognises this reality and actually enhances the processes employed.*

Good Practice Example	*GTR utilise RTS, which is a communication system that is used Fleet Planners and Train Service Managers that is used to convey 'keep to diagram' instructions etc.*
Good Practice Example	*Chiltern have an agreement with Control that lower speed stock changes are associated with a 24-hour request and higher speed stock changes are associated with a 4- hour request. In order to assist with fleet planning the fleet major exam has been moved from mileage to day based.*
Good Practice Example	*Northern have a 3-day plan ahead for units to return to the depot, but acknowledge that there is always a bit of 'backwards and forwards' to get units back to depot.*
Good Practice Example	*SWR reported have Fleet Control Planners that manage disruption through stock control*
Good Practice Example	*GA have a return to depot unit tracker.*
Good Practice Example	*In order to reduce the number of 'set-swaps' AWC worked with their Control teams to improve the data in this area and in addition they have also implemented an improved maintenance planning tool which is designed to generate an automated optimal maintenance plan for their fleets.*
Good Practice Example	*TfWR worked with their Train Planning to address balancing diagrams in the north and south end – focusing on 3 car diagrams.*
Good Practice Example	*In order to reduce the number of units having to return to the depot, TfWR appointed additional Outstations technicians, part funded by their third-party maintainer Alstom.*

6 Depots, Yards and Sidings Performance KPIs

6.1 Overview

There is currently no agreed method of assessing DYS performance and facilitating benchmarking – since all locations have their local differences and peculiarities. Whatever measure is ultimately chosen it should be proportionate and it is accepted that irrespective of the KPI used, it will always be perceived to be 'unfair' on someone.

6.2 Developing DYS KPIs

In order to manage DYS performance, Key Performance Indicators need to be identified and accurately recorded i.e. the generation of 'good data'. This provides the necessary insight in order to identify problems, make correct decisions and to take then necessary management action. The objective here is to obtain 'data driven insights' that allow sufficient delving into the causes of delays to depot departures (and arrivals). Granular data facilitates the analysis of the events leading up to the problems to be identified in order to work out what is going wrong.

As with most things, it is absolutely essential to gain the buy-in from all affected staff and where this has been successfully implemented it is reported that it really is basic management - people simply need to be made accountable. A collaborative approach is essential in that whilst the issues might be cross-industry they are also cross-functional. Everyone affected should be involved since there are many perspectives of what the root cause of the perceived problem is, but a key part of the activity needs to be absolutely data driven and 'myth bust' wherever required. Using the data in this way allows the capabilities of the system to become known to generate an understanding of the actual capability of the DYS and to use the data to improve performance. Analysis of the data allows the depot teams to develop action plans to address the reasons for trains being late off depot.

Learning Point:	*AWC concluded that in order to effectively manage depot performance some good measures are required e.g. timing points reflective of depot departure; measure of drivers prep timings.*
Learning Point:	*GA wanted to improve the performance of their depot at Ilford – illustrated by the following saying "If Ilford sneezes, Greater Anglia catches a cold!" The only way to understand what was going on was to start to dig into the data and found that the level of granularity required was not initially available. It was discovered that effectively the TRUST Responsible Manager Code for Ilford Depot was being used by the wider business as a 'dustbin' – since the code was not being effectively managed. The activities resulted in a performance improvement from around 600 minutes per period to below 100 in a year.*
Learning Point:	*It was reported that Northern's fleet planning tools are currently not clever enough to track trains that are at risk of running out of fuel.*
Learning Point:	*LNER found that that berthing stop positions were also generating delays – since it was found that in one location the trigger point was half-way down a wash road.*

Other successful approaches have relied on the need to change the mindset of people's approach to problems – since if you keep doing the same things nothing will improve. Practitioners report that if you are open and honest about your problems people will help and also reciprocate in terms of their problems.

This mindset can be summarised by the following:

- Keep the problem precious – don't rush to solutions
- Act only on facts – facts are important to move forward
- Do what needs to be done, not what can be done – 'needs' identify what to do, whereas 'can' is based on 'judgement, authority and often volume'

Good Practice Example	*GA started to undertake 'root cause' analysis of Ilford depot performance as part of an 'A3' which contained the following details in relation to areas of delay*

	e.g.: • *Depot Management* • *Late off Maintenance* • *Depot Availability* *The root cause analysis was supported by a 'fishbone' analysis that covered Production, Technical and Operations and weekly workshops were undertaken to allow the key players to discuss what needed to be done to address the problems identified.*
Good Practice Example	*GA decided to convert all depot incidents to an equivalent 'monetary' value and this made things became much easier – since it became a tool that was 'self-managing' since no-one wanted to be 'top of the tree' in terms of business impact and made people stand up and take notice.*
Good Practice Example	*At GA's Ilford Depot, the Yard Movements Controller (YMC) has a comprehensive weekly log that is a live document. The log is used to track:* • *Hand back time* • *Driver on time* • *Train Ready to Start time* • *Path out time* *This log is also used when incidents need to be attributed and anything that is worthy of note, or out of course is also recorded in the log.*
Good Practice Example	*GA undertake the following meetings for their depots:* • *04:00 Stock Maintenance and Planning Meeting: List of Units required back for maintenance is discussed that also considers the amount of space available.* • *09:00 A full list of units returning (and at what times) is produced*
Good Practice Example	*For GA's Ilford Depot, their improved processes are reported to have led to impressive improvement - in that a year-on-year reduction from around 3000 minutes to approximately 600 minutes had been witnessed. These processes now also prevent logistical errors and the depot having too many trains to deal with e.g. being overcapacity. It was stressed that whilst these processes have had a significant impact – they are relatively simple.*
Good Practice Example	*GA hold a monthly meeting to discuss Ilford yard operations that includes NR, ARL, MTREL, Deutsche Bahn and Rail Operations Group. One of the issues being addressed is timings allocated for trains to clear the yard – since from NR's Signallers point of view they see the depot as a 'black hole' and have no appreciation of what goes on and therefore why it takes so long to clear a track circuit. As a result of this a 'timing exercise' was undertaken to track train movements.*
Good Practice Example	*As part of a project to improve the performance of Neville Hill Depot, Northern used the Amey 'Quartz' IT system that was used by station staff to report reasons for train delays. This was achieved by adding Neville Hill as a location in Quartz so that reasons for trains leaving the depot late could be identified.*
Good Practice Example	*Northern discovered that one of the key reasons for late departures being flagged at Neville Hill depot was the discovery that the 'offsets' were wrong in the train plan for trains departing the depot.*
Good Practice Example	*TfWR are also undertaking 'technical preparations' on the most problematic departures prior to the drivers train preparation prior to departure – since it was found that drivers were 'under prepping' their own trains and not necessarily giving sufficient time for e.g. air pressure to build up and also finding and reporting 'silly faults' immediately prior to booked departure times. Typically this is undertaken an hour before departure and this has shown some performance improvement.*

Learning Point:	*LNER discovered that 'berth offset' issues are adversely affecting their performance since despite trains being presented on time from their depots they have been racking up delays on TRUST. There is therefore a need to 'observe' timings on site, but this is problematic due to restricted access to the departure signals.*
Learning Point:	*SWR have been undertaking a trial as part of the industry Performance Improvement Management System and it has identified that SWR do not have clarity or visibility of late starts and late acceptance on depots. Key to this is*

	having a better flow of information which can be achieved by finding a way to get shunters to directly interface with TRUST to allow immediate reporting so that the reasons are clear. Whilst SWR accepted that there are depot complexities and site-specific issues, but without better visibility of late starts and late acceptances it is impossible to understand what is going on at a location and how things could be improved.
Learning Point:	*SWR currently have a plan led approach where stock controllers are in charge. This is related to a previous reorganisation where SWR lost expertise, but efforts are being made to migrate back to train service delivery being the focus, but at the moment creating the plan is the focus.*
Learning Point:	*For the Southeastern fleets they have a 'metro' fleet that is managed by the 'metro' planners but that the fleet is maintained by their 'mainline' team. It is noticeable that the metro fleet has very few 'MS' incidents, whereas the mainline fleet has significantly more 'MS' incidents which is probably as a result of having 3 depots that are geographically spread.*

Irrespective of all the good intentions, understanding depot performance is further complicated by the train type being serviced and maintained at that Depot. Instinctively, it does not seem right to expect comparable performance at depots that receive the same fixed formation e.g. 11-Car Pendolinos – as opposed to DMU depots where trains have to be split and joined to form up the trains.

Good Practice Example	*Ilford depot has 3 TOCs using the facility with 4 different lengths of train being berthed there and complexities around the use of different sidings. GA have started to use 701A incidents per 100,000 miles in order to measure and compare the performance of their Depots.*
Good Practice Example	*AWC look at depot performance in terms of defined targets and NR are also present on the calls. This has enabled 'themes' for each depot to be identified*

The industry has therefore (so far) yet to solve the rather 'knotty' problem of finding a common method of measuring and comparing Depot performance. It has been suggested that there are two measures that 'make sense' that could be standardised, namely the number of late departures and the number of late arrivals, but it is accepted that this data is not necessarily available. Other metrics that could be used include:

- Right time off depot – normalised by the number of departures/diagrams leaving a location
- Right time arrival at depot – normalised by the number of arrivals/diagrams arriving at a location
- MU coded passenger delay minutes / mile
- Number of train movements within the depot.

Good Practice Example	*SWR are liaising with NR in relation to developing Fleet 'Lead Indicators' which includes tracking late arrivals and departures from depots.* *The six indicators SWRs are currently using are as follows:* • *Right time offering to network i.e. delivery of stock for service off depot* • *Right time offering for maintenance i.e. measuring the delivery of the train back to the depot for maintenance – and noted that SWR have still to obtain this consistently for all locations* • *Number of Technical incidents* • *Restrictions in traffic – there is a link to low numbers and good depot performance – both technical and non-technical such as RVAR compliance of disabled toilets.* • *Exam beat rate compliance* • *Monitoring of the work bank against each train class*
Good Practice Example	*AWC are developing some 'Power BI' dashboards to track right time on/off depots in order to identify which headcodes are the worst performers.*
Good Practice Example	*Chiltern have introduced a 'late off log' which is an excel spreadsheet for late departures. This is reported to be a simple thing to get the shunters involved.*

Whatever KPI measure is ultimately agreed upon needs to be fed by data that is readily available without excessive effort required to generate.

7 Depot Infrastructure Maintenance Plan

7.1 Background

The depot infrastructure is equally important (although often overlooked) to performance as the rolling stock and the maintenance teams.

Learning Point:	*Three major incidents had been experienced at GTR's Selhurst Depot which had contributed to MET0 being in the top three codes nationally. A points blade had failed on the depot departure road at 15:00 which was subsequently compounded by a signal failure. It was reported that the points had not been repaired for three weeks*
Learning Point:	*c2c's problems in their DYS at the moment are related to failing 'life expired' infrastructure i.e. the interface boxes to 'clear' the signalling system for trains at the sidings together with problems with the points in sidings as well and that all the problems being experienced have been raised with Senior Management.*

Appendix A: Suggested 'Depot Rules' Document Structure

1. Depot Rules Amendment Process
   Aspects that should be documented:
   a. The routine periodicity for review of the Depot Rules
   b. The process for changing the 'Depot Rules' should be explained e.g. what would instigate a change.

2. Depot / Yard / Siding Diagram
   Aspects that should be documented:
   a. A diagram of the depot / siding facility should be included

3. Timetable Change Arrangements
   Aspects that should be documented:
   a. What are the arrangements in place to routinely communicate the Depot Rules with the Timetable Planners.
      i. Whom? What? When? How?
   b. What are the arrangements in place to ensure any proposed Timetable is compatible with the Depot Rules?
      i. Whom? What? When? How?

4. Depot / Yard or Siding (DYS) Operation
   Aspects that should be documented:
   a. What is the time needed between trains arriving at the DYS?
      i. By train length – if there are differences
   b. What is the time needed between trains departing from the DYS?
      i. By train length – if there are differences
   c. What are the times the DYS is operational e.g. members of staff are available to 'accept' and 'despatch' trains?
   d. What are the times that no arrivals or departures should be scheduled in order to facilitate DYS shunting and formation of train service? – e.g. provision of shunt windows
   e. What is the maximum axle weight that the facility can deal with?
   f. What is the maximum train length that the facility can deal with?
   g. Are there any current operational restrictions applying to the DYS?
   h. What are the operational requirements for 'other TOC's' rolling stock?
   i. What are the operational requirements for 'third party' maintainers?

5. DYS Capacity
   Aspects that should be documented:
   a. Maximum number of trains to be stabled at a depot location – including sidings
      i. Whilst continuing to allow the depot to operate effectively e.g. leaving CET or wash roads free
      ii. How many roads need to remain empty to shunt trains around the depot?
      iii. How many roads need to remain empty as contingency to accept a defective train from service?
   b. All trains (irrespective of TOC) need to be captured.
   c. Capacity of each specific road at a DYS.
   d. Specific activities typically undertaken at each specific road.
   e. Facilities available at each specific depot road.

6. Fleet Maintenance Requirements
   Aspects that should be documented:
   a. What are the specified 'maintenance windows'?
      i. by day of the week / daytime / night-time
   b. Number of trains required for maintenance in the depot facility
      i. by day of the week / daytime / night-time
   c. Minimum maintenance 'touch time' – defined as the time between the train arrival (factoring in shunting requirements to position the train for maintenance) and the planned departure time

(factoring in subsequent shunting requirements for train formation and train preparation etc.)

d. Exceptional maintenance requirements. What is the theoretical maximum? e.g. as a result the need to accommodate engineering works / possessions etc.
e. Diagrams should be provided to 'cycle' the units through maintenance e.g. a range of mileages to prevent maintenance exam 'bunching'
f. ECS diagrams should be provided to facilitate tyre turning and returning defective units to the depot for repair.

7. Fleet 'Traincare' Requirements

Aspects that should be documented:

a. What are the requirements for 'traincare' in terms of maximum capacities for:
    i. Internal Cleaning
    ii. Tanking
    iii. Controlled Emission Toilet (CET)
    iv. External Washing – including vehicle ends
    v. Fuelling
    vi. Sander replenishment

8. Fleet Availability Requirements

Aspects that should be documented:

a. How many trains are required to operate the planned Timetable - by day of the week – if there are differences

9. Fleet Reliability Requirements

Aspects that should be documented:

a. How many 'non-splitting diagrams' are required in order to contain 'degraded' units until the depot is able to repair. Ideally these diagrams should return to the depot.

10. Fleet Operational Requirements

Aspects that should be documented:

a. What are the arrangements for Train Preparation prior to Units entering service?
    i. Whom? What? When? How?
b. What are the associated timings for Train Preparation activities following trains being released for maintenance?

Appendix B: Other Related Guidance Available

Document	Title	Link
RDG-ENG-GN-008: Issue 2.2	RDG Guidance Note: New Trains – A Good Practice Guide	https://www.raildeliverygroup.com/about-us/publications/12913-rdg-eng-gn-008-new-trains-a-good-practice-guide-2-2-draft-clean/file.html
20pp: Issue 15	The Twenty Point Plan – Fleet Management Good Practice Guide – Chapter 7: The Depot	https://www.raildeliverygroup.com/files/Publications/engportal/TheTwentyPointPlan/7TheDepot.pdf
GIGN7621: Issue 1	Guidance for the Development and Design Considerations of Passenger Rolling Stock Depots	https://www.rssb.co.uk/en/standards-catalogue/CatalogueItem/GIGN7621-Iss-1
RP-GN07	Train Depot Good Practice - October 2022	Note: Document is not yet available on the Rail Partners Website

Rail Delivery Group

National Rail

Rail Delivery Group Limited Registered Office, 2nd Floor, 200 Aldersgate Street, London EC1A 4HD
www.raildeliverygroup.com 020 7841 8000 Registered in England and Wales No. 08176197