

System Operator: Capability & Capacity Analysis

South Western Main Line 2018 Path Capacity Study – Phases 1 to 3


Report


Capability & Capacity Analysis


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Document Control	
Scheme Name	South Western Main Line 2018 Path Capacity Study – Phases 1 to 3
Document Location	v:\sap-project\lse\calse000-05-2017-alliance capacity study\paperwork\south western main line 2018 path capacity study phase 1-3 final report v1.2.docx
Version No.	1.2
Status	Final
Author	Nick Brand
Version Date	20/10/2017
Security Level	Confidential

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Document Administration

Change Record			
Version	Date	Author	Reviewers
0.1	05/07/2017	Nick Brand	Toby Saint-Clair
0.2	10/07/2017	Nick Brand	Updated with Saturday findings
0.3	14/07/2017	Nick Brand	Updated with Sunday findings
0.4	21/07/2017	Nick Brand	Updated with Freight Lengthening findings
0.5	31/07/2017	Nick Brand	Updated with Phase 3 findings
0.6	02/08/2017	Nick Brand	Toby Saint-Clair for distribution to Sponsor
0.7	04/08/2017	Nick Brand	Daniel Fredriksson on behalf of the Sponsor
1.0	04/08/2017	Nick Brand	Final Version - Signed
1.1	07/08/2017	Nick Brand	Revised Final Version
1.2	20/10/2017	Nick Brand	Addendum following assessment of solutions for non compliant path.

References			
Ref.	Document Name	Document Ref. No.	Date
001	Alliance Grand Southern 2018 Path Capacity Study – Phase 1 & 2 Remit	v0.2.2	27/06/2017
002	Timetable Planning Rules	V4.0	July 2017
003	Southampton to West Midlands Final Report	V2.0	06/06/2017

Abbreviations	
Acronym	Meaning
C&CA	Capability & Capacity Analysis
Dec16	December 2016
Dec17	December 2017
Dec18	December 2018
ECS	Empty Coaching Stock
SW	SouthWest
TPRs	Timetable Planning Rules
TPS	Timetable Planning System
TT	Timetable

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1. Executive Summary

The aim of this analysis is to assess the December 2018 (Dec18) timetable, to identify if the aspirations of Alliance Grand Southern and the Southwest franchise aspirations can be accommodated in conjunction with other operator's existing paths.

Whilst not specified in the remit, it was identified during the course of this analysis, it would be appropriate to include the future aspirations for lengthened freight of 775m (at increased trailing weights of 1600t/1800t) from the recently completed analysis for the *Southampton-West Mids Freight Lengthening Project*.

The analysis has been done in three phases:

Phase 1 – TPR Compliance Check

An assessment was undertaken to determine if the Alliance aspirations alongside the franchise aspirations and other operator's existing path rights can operate compliantly to the Timetable Planning Rules (TPRs).

The entirety of the concept train plan was not validated; rather sections of the concept train plan were validated around where Alliance has aspirations to run paths.

It was not possible to achieve Timetable Planning Rules' compliance by simply adding the Alliance aspirational paths to the franchise aspirational concept train plan. This applies to all operating days; Monday to Friday, Saturday and Sunday.

Phase 2 – Dec18 Concept Train Plan Flexing

Analysis was undertaken to flex paths accordingly to achieve compliance to the TPRs. Flexing was predominantly made on Alliance and franchise aspirational paths, as these aspirations mainly interact with each other and neither have current access rights for their paths. The flexing of these aspirational paths was done to make the best use of capacity in the concept train plan.

Flexing to other operators paths where access rights are held was avoided where possible. Where flexing was necessary it was done within a parameter of no more than 5 minutes, and returning to booked times at the next nearest location.

All non-compliances to the TPRs identified in Phase 1 were assessed for all operating days; train paths were then flexed appropriately to ensure a concept train plan could be created with TPR compliance. Flexing has been undertaken to make the best use of the capacity.

With the exception of one of the Alliance (Monday-Friday) aspirational paths*, it has been possible within the flexing constraints to accommodate the Alliance's aspirations for Dec18 in a TPR compliant manner with the franchise aspirations and other operator's existing paths.

***Addendum October 2017 (v 1.2)** – Following investigation by Alliance Rail and collaboration with Network Rail this exception no longer applies. All paths can now be accommodated in a TPR compliant manner.

The key findings for each of the operating days are as follows:

Monday to Friday (SX)

Of 28 Alliance aspirational paths, 5 could be accommodated in the concept train plan without having to flex any trains.

22 Alliance aspirational paths could be accommodated by applying flexing to the concept train plan; all flexing was within the constraints and undertaken to make the concept train plan TPR compliant.

1 of the Alliance aspirational paths could not be made TPR compliant within the flexing constraints of the analysis*. A decision would be required on how the capacity is allocated between operators.

***Addendum October 2017 (v 1.2)** – Following investigation by Alliance Rail and collaboration with Network Rail this path can now be accommodated in a TPR compliant manner.

This was possible due to Alliance Rail using more extensive flexing to their train than the agreed parameters for the original assessment allowed, which has offered two options for this path. Both options have been assessed by Network Rail to meet TPR compliance within the concept train plan.

Saturday (SO)

Of 21 Alliance aspirational paths, 6 could be accommodated in the concept train plan without having to flex any trains. These Alliance trains were all Empty Coaching Stock (ECS) moves.

The remaining 15 Alliance aspirational paths could be accommodated by applying flexing to the concept train plan; all flexing was within the constraints and undertaken to make the concept train plan TPR compliant.

Sunday (Su)

Of 22 Alliance aspirational paths, 9 could be accommodated in the concept train plan without having to flex any trains. 6 of these Alliance trains were all Empty Coaching Stock (ECS) moves, the remaining 3 trains were Class 1 passenger services.

The remaining 13 Alliance aspirational paths could be accommodated by applying flexing to the concept train plan; all flexing was within the constraints and undertaken to make the concept train plan TPR compliant.

Southampton to West Midlands Freight Lengthening

The longer/heavier freight aspirational paths were assessed in the concept train plan after the above mentioned flexing had been made. Therefore the freight assessment was made with the Alliance and franchise aspirations being TPR compliant.

The freight aspirational paths were taken from the analysis carried out for the Southampton to West Midlands Freight Lengthening Timetable Validation project, report dated 6 June 2017.

18 of the 44 longer/heavier freight aspirational paths could not operate in conjunction with the Alliance and franchise aspirations during an initial assessment.

However, after applying flexing to the concept train plan, within the flexing constraints it was possible to accommodate 13 of the 18 aspirational freight paths in the concept train plan in compliance with the TPRs

The remaining 5 freight paths all conflict with franchise aspirational paths only (not Alliance paths), and could not be accommodated compliantly by flexing within the constraints for this analysis. An initial assessment suggests the conflicting franchise aspirational paths would have to be removed from the concept train plan in order to accommodate the remaining 5 freight paths identified in the previous study.

Phase 3 – Capacity Assessment

A capacity assessment was completed of the Wessex mainline (SW105 route) where the Alliance aspirations are proposed to operate. The assessment covered from 05:00 until 22:59 as this time period covers when the Alliance aspirational paths are proposed to operate within and calculated the capacity usage at four key locations; Clapham Junction, Farnborough, Winchester and Eastleigh.

The capacity usage was calculated for both the Dec16 Current Timetable and the Dec18 Concept Train Plan to enable a comparison between the two.

The findings show that the Dec18 Concept Train Plan has a higher capacity usage at the four locations than the Dec16 Current Timetable. Alliance aspirational paths amount to an increase in average capacity usage of 2.29% (1/3rd of the overall total increase). However, the majority of the increase in average usage is as a result of the aspirational paths of the SW franchise (increase of 4.58%, 2/3rds of the overall total increase).

It should be noted that the results of this capacity assessment do not infer the potential impact if any on timetable or train performance. Any assessment and comments regarding performance are to be provided by the Southwest Route Team.

2. Introduction

From the December 2017 timetable (Dec17 TT) Alliance Grand Southern aspire to operate trains on the Wessex mainline between London Waterloo and Southampton Central.

Alliance Grand Southern has bid paths which are currently being assessed within the December 2017 timetable.

As the franchise timetable is likely to change between Dec17 and Dec18 this piece of analysis was required to assess whether Alliance's aspirational paths can be accommodated in the 2018 concept train plan alongside the aspired franchise services and those existing rights held by other operators.

There is also a future aspiration for freight between Southampton and the West Midlands to operate at an increased length of 775m, with increased trailing weights of 1600t/1800t. The analysis for this aspiration has been previously completed against the Dec16 TT under the *Southampton-West Mids Freight Lengthening Project*. Whilst not included in the remit for this analysis, the findings of the freight lengthening project were assessed for this analysis and considered with the Alliance and franchise aspirations for Dec18.

2.1. Aims & Objectives

The objective of the analysis was to assess the concept train plan for December 2018 to identify if Alliance's aspired level of service can be accommodated alongside the rights held by other operators and the aspirations of the new SW franchise operator, as well as the future freight aspirations.

All paths needed to be compliant with the Timetable Planning Rules. If this could not be achieved then a separate assessment was needed to identify whether they can be operated compliantly. An additional assessment was required to determine what capacity the concept train plan uses.

3. Assumptions & Methodology

3.1. Assumptions

3.1.1. Geographic Scope

The geographic scope for the analysis was the Southwest mainline between London Waterloo and Southampton Central which runs via Clapham Junction, Woking and Basingstoke.



Figure 1. Map of the Southwest network – main line highlighted.

3.1.2. Boundaries

Location	Line of Route Code
London Waterloo	SW100
Clapham Junction	SW100 / SW105
Southampton Central	SW105

3.1.3. Concept train plan Scope

The analysis initially assessed a weekday concept train plan between the hours of 0700-2000 at London Waterloo. In terms of the peak hours these are assumed to be taken at London Waterloo as follows:

- Morning Peak 0700 to 1000
- Evening Peak 1600 to 2000

This was followed by assessments of the Saturday and Sunday concept train plans between the hours 0700-2000.

3.1.4. Timetable Planning Rules (TPRs)

The analysis used the 2018 Timetable Planning Rules v3.0.

3.1.5. Exceptions to the TPRs

There were no exceptions to the TPRs used within the analysis.

3.1.6. Timing Load Assumptions

All timing loads were as per the aspirational paths provided by Alliance, the SW franchise concept train plan, and other operators as per their paths in the May 2017 timetable.

The exceptions were the freight paths with increased lengths and weights as per the output of the Southampton-West Midlands Freight Lengthening Project.

3.1.7. Concept Train Plan Base

The base for the analysis was taken to be the paths which other operators currently hold rights to in the May 2017 timetable which will still be in effect as of December 2018.

To this the SW franchise aspired service concept train plan as bid as part of the SW Franchise process was overlaid along with the Alliance aspirational paths.

Confirmation was sought from FirstGroup that their concept train plan as bid during the franchise process was still representative of the timetable they intend to operate. Where they advised there were changes to the bid concept train plan, these changes were incorporated into the base for this analysis and highlighted as deviations from the bid concept train plan.

3.1.8. Concept Train Plan Variants

Following assessment of the base, the freight paths as per the output of the Southampton-West Midlands Freight Lengthening Project were inserted for an assessment to be completed with the future freight aspirations.

3.1.9. Base Infrastructure

The base infrastructure for the analysis was as per the current infrastructure with the addition of the London Waterloo enhancements; platforms 20-24 reopened and extensions at platforms 1 to 6.

3.2. Methodology

A project was created in the Timetable Planning System (TPS); this project incorporated the aspired SW franchise concept train plan, aspired Alliance paths and all other operator paths with current rights (the concept train plan base).

With all services combined in the TPS project an assessment was carried out to assure the correct quantum of train paths (including freight) were present for the analysis.

3.2.1. Phase 1 – TPR Compliance Check

Once the quantum of train paths had been assured to be correct, analysis was undertaken to assess if the Alliance aspirations alongside the franchise aspirations and other operator's existing path rights are compliant with the minimum values stated in the Timetable Planning Rules (TPRs) 2018 v3.0.

The entirety of the concept train plan was not validated; rather sections of the concept train plan were validated around where Alliance has aspirations to run paths.

3.2.2. Phase 2 – Dec18 Concept Train Plan Flexing

In the event that the Alliance aspirations could not be directly accommodated in the concept train plan base, the analysis explored the options available to accommodate the paths by flexing any paths in the concept train plan in order to achieve TPR compliant paths.

Flexing was predominantly made on Alliance and franchise aspirational paths, as these aspirations mainly interact with each other and neither have current access rights for their paths. The flexing of these aspirational paths was done to make the best use of capacity in the concept train plan.

Flexing to other operators paths where access rights are held was avoided where possible. Where flexing was necessary it was done within a parameter of no more than 5 minutes, and returning to booked times at the next nearest location.

Details of the options identified through the flexing of paths have been documented and are provided as part of the report (see Appendix A).

In determining the options available to accommodating all paths together, all paths needed to be compliant with the minimum values stated in the Timetable Planning Rules (TPRs) 2018 v3.0.

The paths from the Southampton-West Midlands Freight Lengthening Project were then inserted, replacing the current concept train plan versions in order to assess the Alliance and franchise aspirations in conjunction with the future freight aspirations.

3.2.3. Phase 3 – Capacity Assessment

Phase 3 of the analysis assessed the capacity usage on the Wessex mainline (SW105 route) where the Alliance aspirations are proposed to operate. The assessment covered from 05:00 until 22:59 as this time period covers when the Alliance aspirational paths are proposed to operate within.

The assessment focused on selected compulsory timing points spread along the route; Clapham Junction, Farnborough, Winchester and Eastleigh.

These four locations were chosen to represent the majority of the Southwest Main Line: Clapham Junction is the timing point that all Main Line services will travel through, Farnborough is the closest mandatory timing point to Winchfield, where all Alliance paths are assumed to change running lines, Winchester is the mandatory timing point in the 2-track section of the line and many services will originate or terminate at Eastleigh T&RSMD via Eastleigh station.

The intention was to also undertake the assessment at Basingstoke, Woking and Southampton Central, however due to the complexity of the operations at these locations it was not possible to carry out accurate analysis in the time available.

The capacity for the December 18 Concept Train Plan was assessed by extracting the services from TPS, then interrogating them using excel to produce a list of routeings through each of the four locations, along with the number of services using each routing in a given hour. The TPRs were then used to assign a capacity usage value to each routing, which could be used to calculate the capacity usage in minutes during hour blocks.

The capacity value for each routing was calculated by separating each timing point out into platforms and lines at each side of the timing point and determining how soon after the given routing that the line or platform could be occupied by another service.

The capacity usage in an hour was averaged over the lines at either side of the timing point and the platforms and the maximum of these three averages was considered to be the capacity usage for the station in that hour.

An identical assessment was then undertaken for the December 16 timetable to enable a comparison between the capacity usage in the current operating timetable and the proposed concept train plan.

4. Findings

4.1. Network Rail Strategic Paths

Network Rail Strategic Paths for freight are included in the concept train plan as other operator paths; as part of the analysis it has not been necessary to assess these paths in detail as they did not fall within the sections for analysis, based on Alliance aspirations.

As part of this analysis it has been noted that there may be clashes between Network Rail Strategic paths and franchise aspirational paths. This is due to decisions made in the franchise process to remove Network Rail Strategic paths from the paths that the franchise bidders had to consider.

Further analysis may be required to ensure that Network Rail Strategic paths and franchise aspirational paths are TPR compliant with one another.

4.2. Phase 1 – TPR Compliance Check

It was not possible to achieve Planning Rules' compliance by simply adding the Alliance Aspirational paths to the Franchise aspirational concept train plan. This applies to all operating days; Monday to Friday, Saturday and Sunday.

Consequently Phase 2 of the analysis was undertaken to flex paths accordingly to achieve a TPR compliant concept train plan.

4.3. Phase 2 – Dec18 Concept Train Plan Flexing

Monday to Friday (SX)

All non-compliances to the TPRs have been assessed for the Monday to Friday concept train plan and train paths have been flexed appropriately, within the constraints, to ensure TPR compliance. The flexing has been done to make the best use of the capacity.

Of the total of 28 Alliance aspirational paths, 5 could be accommodated in the concept train plan without having to flex any trains.

22 Alliance aspirational paths could be accommodated by applying flexing to the concept train plan; all flexing was within the constraints and undertaken to make the concept train plan TPR compliant.

Details of all flexing and valid paths are listed in Appendix A, in order of the Alliance aspirational path train head codes.

1 of the Alliance aspirational paths could not be made TPR compliant within the flexing constraints of the analysis.

This is the Alliance path 1B52MT (Southampton to Waterloo), with the lack of spare capacity being from Worting Junction, which becomes more constrained from Surbiton, then further from Wimbledon. The aspiration is to operate this path in the evening peak, with 1B52MT being the additional evening peak Alliance aspiration for the Dec18 timetable.

Adding timing allowances to flex trains to meet compliance would require amendments to at least 13 services before a sufficient break in the concept train plan occurs, moving towards the end of the evening peak. Flexing services would also result in later arrivals in Waterloo, which would impact the subsequent departures from Waterloo of the services formed from the arrivals.

Three options have been considered for resolving the conflict identified in the concept train plan:

- Run 1B52MT in the franchise aspirational path for 1L56CA (Exeter St Davids to Waterloo via Salisbury) from Worting Junction. The impact of this option would be losing the Exeter service altogether or turning round at either Salisbury or Andover which would lose the connection to London (Waterloo). The option to run 1L56CA to Basingstoke and turnround is not viable as a non-compliance occurs before Basingstoke, at Worting Junction.
- Run 1B52MT in the franchise aspirational path for 1B30CA (Poole to Waterloo) from Southampton. The impact of this option would be to run 1B30CA from Poole to Southampton, departing Poole 2mins earlier, providing connectivity at Southampton with 1B52MT for the onward journey to Waterloo.
- Remove the aspiration to run 1B52MT from the concept train plan in order to ensure a TPR compliance can be maintained

From a TPR point of view, with the exception of the one section above, it has been possible to accommodate Alliance and franchise aspirations in conjunction with other operator's existing paths in a TPR compliant manner.

4.3.1. Addendum October 2017 (v 1.2)

Since version 1.1 of the report was issued on 7th August 2017 and following collaboration between Alliance Rail and Network Rail, valid TPR compliant paths have now been found for 1B52MT in the concept train plan; this being the one train which a TPR compliant path could not be originally found for, as detailed above.

Alliance Rail had investigated alternative solutions to accommodate 1B52MT using more extensive flexing to the Alliance train than the agreed parameters for the original assessment allowed. Upon finding two alternative paths for 1B52MT, Alliance Rail contacted the Capability and Capacity Analysis team at Network Rail to progress the assessment of the alternative solutions.

Full train schedules of the alternative paths and other interacting services requiring amendments were provided to Network Rail by Alliance Rail. These schedules were added to the concept train plan and an assessment was completed accordingly.

The assessment has found that both alternative paths can be accommodated in the concept train plan, facilitated by small amendments suggested by Alliance Rail to four interacting services and all meet TPR compliance. The alternative paths are 1B52CH (an earlier departure from Southampton Central) and 1B52GS (originating from Eastleigh instead of Southampton Central).

Saturday (SO)

All non-compliances to the TPRs have been assessed for the Saturday concept train plan and train paths have been flexed appropriately, within the constraints, to ensure TPR compliance. The flexing has been done to make the best use of the capacity.

Of the total of 21 Alliance aspirational paths, 6 could be accommodated in the concept train plan without having to flex any trains. These Alliance trains were all Empty Coaching Stock (ECS) moves.

The remaining 15 Alliance aspirational paths could be accommodated by applying flexing to the concept train plan; all flexing was within the constraints and undertaken to make the concept train plan TPR compliant.

Details of all flexing and valid paths are listed in Appendix A, in order of the Alliance aspirational path train head codes.

From a TPR point of view, it has been possible to accommodate Alliance and franchise aspirations in conjunction with other operator's existing paths in a TPR compliant manner.

Sunday (Su)

All non-compliances to the TPRs have been assessed for the Sunday concept train plan and train paths have been flexed appropriately, within the constraints, to ensure TPR compliance. The flexing has been done to make the best use of the capacity.

Of the total of 22 Alliance aspirational paths, 9 could be accommodated in the concept train plan without having to flex any trains. 6 of these Alliance trains were all Empty Coaching Stock (ECS) moves, the rest were Class 1 passenger services.

The remaining 13 Alliance aspirational paths could be accommodated by applying flexing to the concept train plan; all flexing was within the constraints and undertaken to make the concept train plan TPR compliant.

Details of all flexing and valid paths are listed in Appendix A, in order of the Alliance aspirational path train head codes.

From a TPR point of view, it has been possible to accommodate Alliance and franchise aspirations in conjunction with other operator's existing paths in a TPR compliant manner.

Southampton to West Midlands Freight Lengthening

With the paths from the Southampton-West Midlands Freight Lengthening Project inserted, the Dec18 concept train plan was re-assessed to determine how the future freight aspirations are effected by the Alliance and franchise aspirations.

The re-assessment was done against the version of the Dec18 concept train plan created within this study, following the flexing of any services as detailed above and in Appendix A. This was to ensure that TPR compliance had been met before the future freight aspirations were added.

The output of the lengthening project had determined that 44 freight paths could operate in the current (Dec16) timetable at increased length and weight.

The initial re-assessment of the Dec18 concept train plan found that 18 of the longer/heavier freight aspirational paths could not operate in conjunction with the Alliance and franchise aspiration during an initial assessment.

However, after applying flexing to the concept train plan, within the flexing constraints it was possible to accommodate 13 of the aspirational freight paths in the concept train plan in a compliance with the TPRs

The remaining 5 freight paths all conflict with franchise aspirational paths only (not Alliance paths), and could not be accommodated compliantly by flexing within the constraints for this analysis. An initial assessment suggests the conflicting franchise aspirational paths would have to be removed from the concept train plan in order to accommodate the remaining 5 freight paths identified in the previous study.

4.4. Phase 3 – Capacity Assessment

The capacity assessment was undertaken for each hour between 05:00 and 22:59 over the four key timing points along the Southwest Main Line: Clapham Junction, Farnborough, Winchester and Eastleigh.

Ideally the assessment would have been carried out at Basingstoke, Woking and Southampton Central; however, due the complexity of the operations at these locations it was not possible to carry out accurate analysis in the time available.

The capacity usage (see Methodology section 3.2.3) in an hour was averaged over the lines at either side of the timing point and the platforms, and the maximum of these three averages was considered to be the capacity usage for the station in that hour.

To enable comparisons, the capacity usage has been calculated for the Dec18 Concept Train Plan including the Alliance Paths (All trains), the Dec18 Concept Train Plan excluding the Alliance Paths and the Dec16 Current Timetable.

The full results are in **Table 1. Capacity Usage Results and Comparison Table** shown on the next page.

The difference column is the increase or decrease in capacity usage between the December 16 current operating timetable and the December 18 Concept Train Plan;

- 0.00% = no change.
- 0.01% and above = an increase in capacity usage in the December 18 Concept Train Plan.
- -0.01% and below = a decrease in capacity usage in the December 18 Concept Train Plan.

Increases and decreases are absolute percentage changes over 60 minutes; for example a current usage of 50% indicates that the location is occupied for 30 minutes within the hour. A 10% increase to 60% in the concept train plan means the location would be occupied for 36 minutes in the hour.

The average column and row show the difference in average capacity per hour for all locations (column) and the average for each location across all hours (row). The table shows the average capacity usage increases at all locations and across all hours.

The bottom right cell of the table shows the total average difference for all locations, across all hours with a capacity usage increase of 6.87%.

Table 2. Dec18 Concept Train Plan Breakdown shows the total capacity usage of the Dec18 Concept Train Plan, the usage with the Alliance paths excluded and the usage of the Alliance paths.

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	Dec 18 Concept Train Plan				Dec 16 Current Operating Timetable				Difference				Average
	Clapham Jn.	Farnborough	Winchester	Eastleigh	Clapham Jn.	Farnborough	Winchester	Eastleigh	Clapham Jn.	Farnborough	Winchester	Eastleigh	
0500-0559	18.83%	5.83%	32.92%	28.50%	11.67%	4.17%	16.25%	23.33%	7.17%	1.67%	16.67%	5.17%	7.67%
0600-0659	57.17%	24.38%	52.50%	38.13%	42.33%	14.38%	33.75%	37.92%	14.83%	10.00%	18.75%	0.21%	10.95%
0700-0759	70.50%	31.25%	47.92%	37.17%	61.67%	25.00%	47.92%	33.33%	8.83%	6.25%	0.00%	3.83%	4.73%
0800-0859	73.67%	31.25%	61.25%	33.50%	66.83%	24.38%	44.58%	28.75%	6.83%	6.88%	16.67%	4.75%	8.78%
0900-0959	71.00%	35.00%	55.00%	34.33%	62.17%	32.50%	56.67%	39.79%	8.83%	2.50%	-1.67%	-5.46%	1.05%
1000-1059	66.00%	32.50%	60.83%	25.63%	60.33%	32.50%	43.33%	27.92%	5.67%	0.00%	17.50%	-2.29%	5.22%
1100-1159	67.17%	30.00%	46.67%	30.83%	60.83%	33.75%	44.17%	28.33%	6.33%	-3.75%	2.50%	2.50%	1.90%
1200-1259	66.00%	31.25%	64.17%	39.38%	61.00%	32.50%	48.75%	25.83%	5.00%	-1.25%	15.42%	13.54%	8.18%
1300-1359	66.50%	31.25%	58.33%	29.79%	60.50%	33.75%	45.00%	23.13%	6.00%	-2.50%	13.33%	6.67%	5.88%
1400-1459	66.00%	28.75%	56.67%	28.75%	62.83%	28.75%	49.17%	22.08%	3.17%	0.00%	7.50%	6.67%	4.33%
1500-1559	66.00%	33.75%	55.00%	30.83%	60.83%	28.75%	45.00%	23.54%	5.17%	5.00%	10.00%	7.29%	6.86%
1600-1659	69.33%	32.50%	58.33%	30.83%	57.50%	31.25%	46.67%	25.50%	11.83%	1.25%	11.67%	5.33%	7.52%
1700-1759	77.33%	37.92%	62.92%	28.75%	60.17%	29.79%	48.75%	30.00%	17.17%	8.13%	14.17%	-1.25%	9.55%
1800-1859	75.33%	36.67%	57.50%	32.00%	61.00%	30.83%	48.75%	34.58%	14.33%	5.83%	8.75%	-2.58%	6.58%
1900-1959	72.17%	34.17%	55.83%	33.83%	66.33%	27.50%	42.50%	21.83%	5.83%	6.67%	13.33%	12.00%	9.46%
2000-2059	66.67%	31.25%	62.50%	26.67%	58.50%	30.21%	43.33%	28.13%	8.17%	1.04%	19.17%	-1.46%	6.73%
2100-2159	65.33%	30.00%	48.75%	44.33%	57.00%	24.17%	42.92%	38.67%	8.33%	5.83%	5.83%	5.67%	6.42%
2200-2259	65.83%	27.50%	40.42%	26.83%	44.33%	16.67%	32.08%	20.42%	21.50%	10.83%	8.33%	6.42%	11.77%
Average									9.17%	3.58%	11.00%	3.72%	6.87%

Table 1. Capacity Usage Results and Comparison Table

Capability & Capacity Analysis

South Western Main Line 2018 Path Capacity Study – Phases 1 to 3

Report

	December 18 Concept Train Plan (Total)				Dec18 Concept Train Plan Without Alliance Paths				Dec18 Concept Train Plan Alliance Paths Only				Average
	Clapham Jn.	Farnborough	Winchester	Eastleigh	Clapham Jn.	Farnborough	Winchester	Eastleigh	Clapham Jn.	Farnborough	Winchester	Eastleigh	
0500-0559	18.83%	5.83%	32.92%	28.50%	18.83%	5.83%	29.17%	27.33%	0.00%	0.00%	3.75%	1.17%	1.23%
0600-0659	57.17%	24.38%	52.50%	38.13%	55.83%	23.13%	52.50%	38.13%	1.33%	1.25%	0.00%	0.00%	0.65%
0700-0759	70.50%	31.25%	47.92%	37.17%	69.83%	30.00%	44.17%	34.67%	0.67%	1.25%	3.75%	2.50%	2.04%
0800-0859	73.67%	31.25%	61.25%	33.50%	72.33%	30.00%	53.33%	28.50%	1.33%	1.25%	7.92%	5.00%	3.88%
0900-0959	71.00%	35.00%	55.00%	34.33%	69.00%	32.50%	55.00%	34.33%	2.00%	2.50%	0.00%	0.00%	1.13%
1000-1059	66.00%	32.50%	60.83%	25.63%	65.33%	31.25%	52.92%	20.83%	0.67%	1.25%	7.92%	4.79%	3.66%
1100-1159	67.17%	30.00%	46.67%	30.83%	65.00%	28.75%	42.50%	28.83%	2.17%	1.25%	4.17%	2.00%	2.40%
1200-1259	66.00%	31.25%	64.17%	39.38%	65.33%	30.00%	60.42%	36.46%	0.67%	1.25%	3.75%	2.92%	2.15%
1300-1359	66.50%	31.25%	58.33%	29.79%	64.33%	30.00%	54.17%	27.92%	2.17%	1.25%	4.17%	1.88%	2.36%
1400-1459	66.00%	28.75%	56.67%	28.75%	65.33%	27.50%	52.92%	25.83%	0.67%	1.25%	3.75%	2.92%	2.15%
1500-1559	66.00%	33.75%	55.00%	30.83%	64.67%	31.25%	50.83%	28.33%	1.33%	2.50%	4.17%	2.50%	2.63%
1600-1659	69.33%	32.50%	58.33%	30.83%	68.67%	32.50%	54.58%	27.92%	0.67%	0.00%	3.75%	2.92%	1.83%
1700-1759	77.33%	37.92%	62.92%	28.75%	76.00%	35.42%	55.00%	25.42%	1.33%	2.50%	7.92%	3.33%	3.77%
1800-1859	75.33%	36.67%	57.50%	32.00%	73.33%	32.92%	53.75%	30.33%	2.00%	3.75%	3.75%	1.67%	2.79%
1900-1959	72.17%	34.17%	55.83%	33.83%	70.17%	32.92%	51.67%	30.67%	2.00%	1.25%	4.17%	3.17%	2.65%
2000-2059	66.67%	31.25%	62.50%	26.67%	66.00%	30.00%	58.33%	26.67%	0.67%	1.25%	4.17%	0.00%	1.52%
2100-2159	65.33%	30.00%	48.75%	44.33%	65.33%	28.75%	44.58%	35.00%	0.00%	1.25%	4.17%	9.33%	3.69%
2200-2259	65.83%	27.50%	40.42%	26.83%	65.83%	27.50%	40.42%	24.00%	0.00%	0.00%	0.00%	2.83%	0.71%
Average	65.60%	30.29%	54.31%	32.23%	64.51%	28.90%	50.35%	29.51%	1.09%	1.39%	3.96%	2.72%	2.29%

Table 2. Dec18 Concept Train Plan Breakdown

The key conclusions from the data for each location are as follows (note: percentages are rounded to the nearest 1%).

The graphs included show the comparison between the Dec18 Concept Train Plan, including and excluding the Alliance paths and the Dec16 Current Timetable for each location.

Clapham Junction

In the Dec16 Current Timetable there is between 60% and 66% capacity usage at Clapham Junction throughout most of the day, from 0700-1959. The exception being 1600-1659 where there is a drop to 58%.

The Dec18 Concept Train Plan including the Alliance Paths has over 70% capacity usage at Clapham Junction in both the morning and evening peaks. Off-peak hours show usage in the mid 60s (%) which includes through until 2259.

The Alliance paths contribute to an average of 1% across the entire period, with a rounded contribution of 2% in the following hours; 0900-0959, 1100-1159, 1300-1359, 1800-1859 and 1900-1959.

All hours see an increase in capacity usage in the Dec18 Concept Train Plan with the evening peak in particular seeing significant increases.

The following hours have an increase of more than 10%;

- 0600-0659 = 15%
- 1600-1659 = 12%
- 1700-1759 = 17%
- 1800-1859 = 14%
- 2200-2259 = 22%.

Of these hours, only 1800-1859 has relatively more Alliance paths compared to the other hours with a figure of 2%. Therefore the increase in capacity usage appears mainly due to the franchise paths.

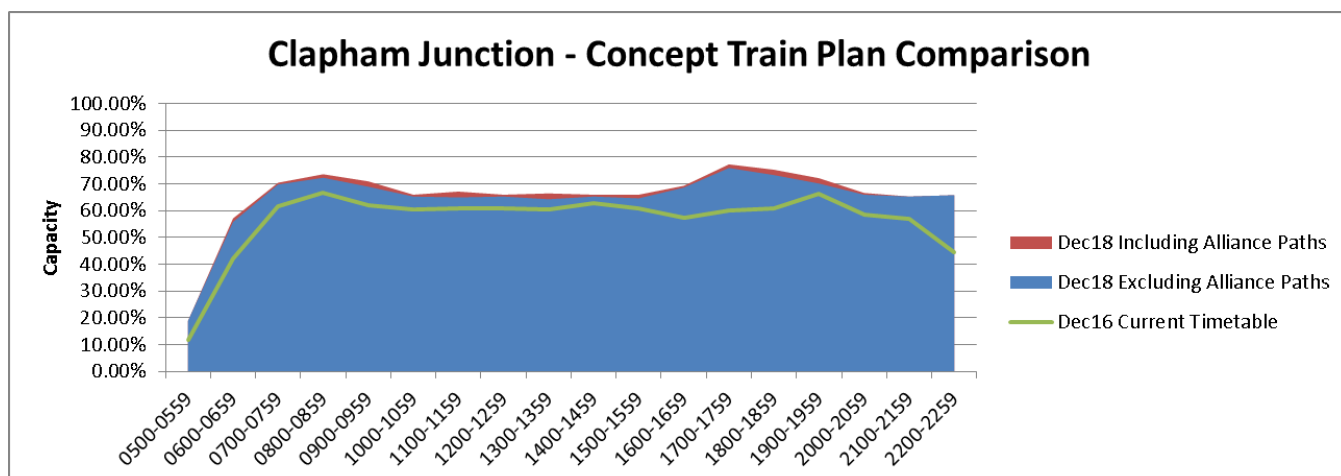


Figure 1: Capacity Usage of Clapham Junction – Concept Train Plan Comparison

Farnborough

The Dec16 Current Timetable Usage at Farnborough is consistent throughout the period from 0900 to 2059, ranging from 28% to 34%.

The Dec18 Concept Train Plan usage at Farnborough is reasonably consistent throughout the period from 0700 to 2159, ranging from 30% to 38%.

The Alliance paths contribute to an average of 1% across the entire period, with a rounded contribution of 2% in the following hours; 0900-0959, 1100-1159, 1300-1359, 1800-1859 and 1900-1959.

The capacity usage at Farnborough generally increases in the Dec18 Concept Train Plan by no more than 7%. The highest increases are in the hours; 0600-0659 = 10%, 1700-1759 = 8% and 2200-2259 = 11%.

Of these hours 1700-1759 has a higher number of Alliance paths at 3%. The hours of 0600-0659 and 2200-2259 have 1% and 0% Alliance paths respectively. Therefore the increase in capacity usage during these hours appears mainly due to the franchise paths.

There are decreases in the usage in the 3 consecutive hours from 1100-1359.

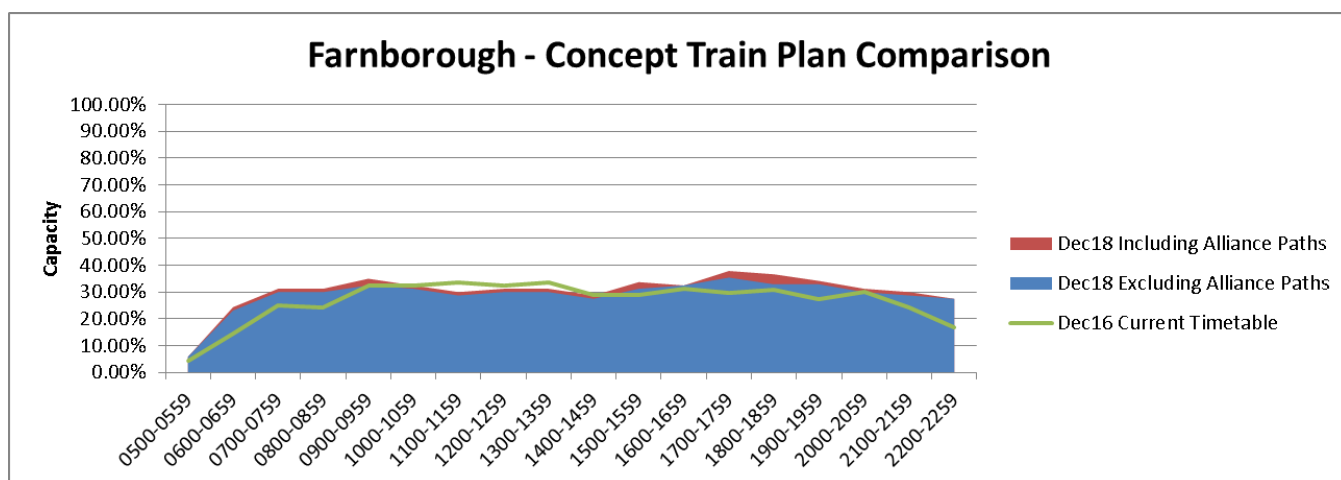


Figure 2: Capacity Usage of Farnborough – Concept Train Plan Comparison

Winchester

In the Dec16 Current Timetable at Winchester the usage varies more widely from hour to hour than the other locations. Between 0700-2159 the usage ranges from a low of 43% (1900-1959) to a high of 57% (0900-0959).

In the Dec18 Concept Train Plan at Winchester the usage varies more widely from hour to hour than than the other locations. The higher percentages are in the morning and evening peak hours (0800-0859 = 61% and 1700-1759 = 63%), the midday off-peak (1200-1259 = 64%) and later in the evening (2000-2059 = 63%).

The Alliance paths contribute to an average of 4% across the entire period at Winchester. However during the morning and evening peak hours (0800-0859 and 1700-1759 as above) the Alliance contribution is higher at 8%. During the midday off-peak (1200-1259) and the later evening hour (2000-2059) the Alliance contributions are 4% as per the average.

The capacity usage increases by an average of 11% across the entire period in the Dec18 Concept Train Plan at Winchester. However there are several hours which exceed the average and which include hours during the morning and evening peaks;

- 0500-0559 = 17%
- 0600-0659 = 19%
- 0800-0859 = 17%
- 1000-1059 = 18%
- 1200-1259 = 15%
- 1300-1359 = 13%
- 1600-1659 = 12%
- 1700-1759 = 14%
- 1900-1959 = 13%
- 2000-2059 = 19%.

Of the above hours the number of Alliance paths is at its highest of 8% during 0800-0859, 1000-1059 and 1700-1759. Therefore during those 3 hours the Alliance paths contribute to relatively more of the capacity usage increases compared to other hours.

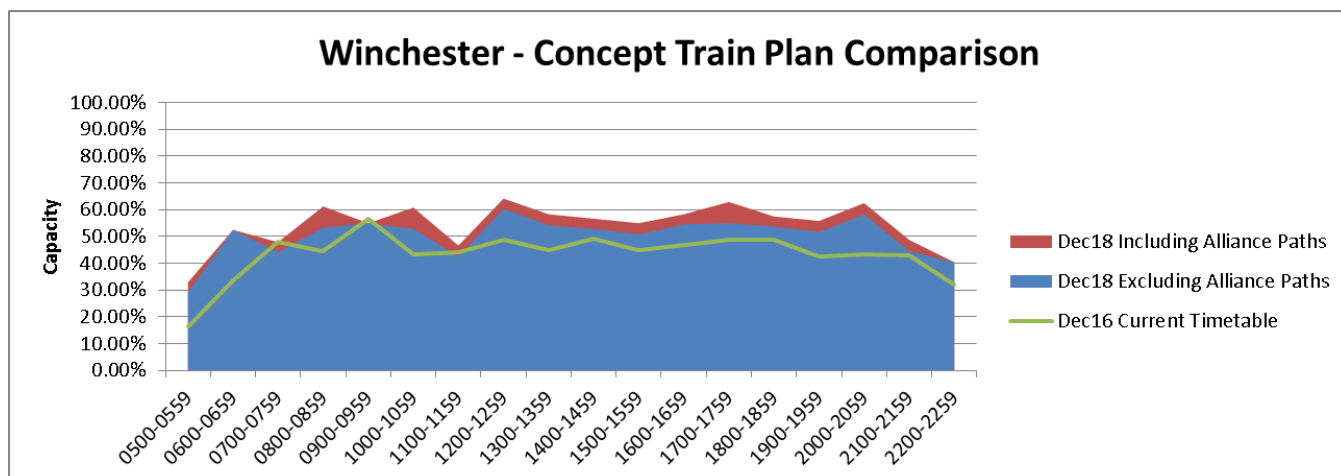


Figure 3: Capacity Usage of Winchester – Concept Train Plan Comparison

Eastleigh

In the Dec16 Current Timetable Eastleigh capacity usage during the off-peak (1000-1659) stays within the 20s (%). The high usage is in the hours 0600-0659 = 38%, 0900-0959 = 40%, 1800-1859 = 35% and 2100-2159 = 39%.

In the Dec18 Concept Train Plan Eastleigh capacity usage generally ranges from the high 20s to mid 30s (%). The highest used hours are; 0600-0659 = 38%, 0700-0759 = 37%, 1200-1259 = 39% and 2100-2159 = 44%.

During these hours the Alliance path capacity usage varies; 0600-0659 = 0%, 0700-0759 and 1200-1259 = 3% and 2100-2159 = 9%. Therefore the Alliance paths are contributing a higher ratio of usage in the hour 2100-2159 compared to other hours.

The average capacity usage at Eastleigh across all hours for the Alliance paths is 3%.

The capacity usage increases in the Dec18 Concept Train Plan are predominantly in the off-peak and the start of the evening peak, from 1100 to 1659. The significant increase is 14% during the hour 1200-1259 which is the highest increase at Eastleigh all day. The other increases during this period are; 1100-1159 = 3%, 1300-1359 = 7%, 1400-1459 = 7%, 1500-1559 = 7% and 1600-1659 = 5%.

The other significant increase is 12% in the hour 1900-1959.

There are hours littered throughout the day which see a decrease in the capacity usage and in particular parts of the morning and evening peaks; 0900-0959 = -5%, 1000-1059 = -2%, 1700-1759 = -1% and 1800-1859 = -3%.

During the hours which see the largest increases (1200-1259 = 14% and 1900-1959 = 12%) the capacity used by Alliance paths is 3% which is the average across the whole period. This is also the case with the other hours highlighted above which see increases.

Therefore the increase in capacity usage at Eastleigh appears mainly due to the franchise paths.

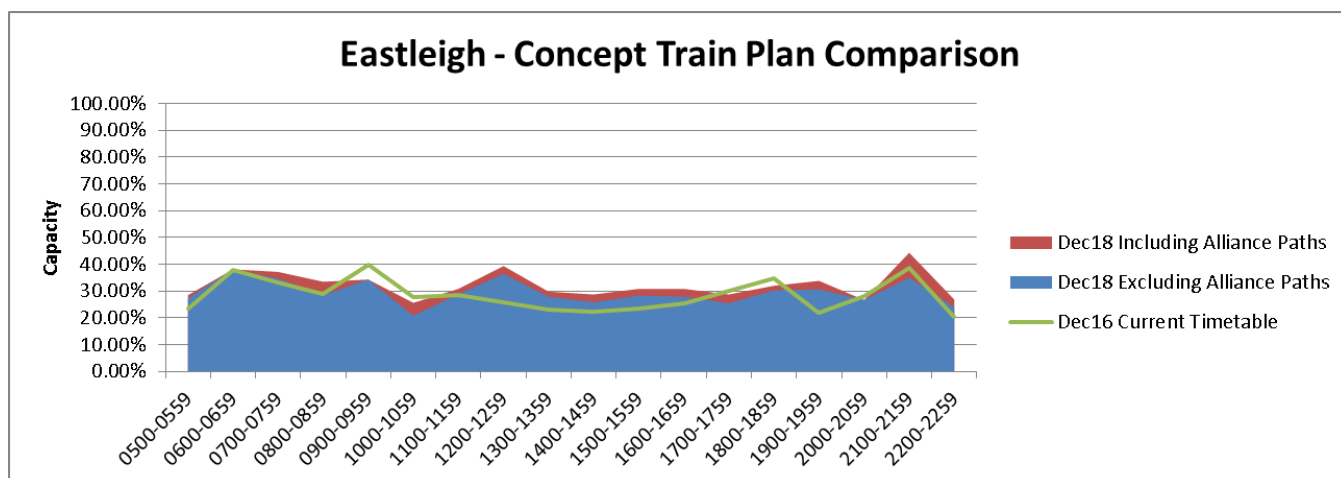


Figure 4: Capacity Usage of Eastleigh – Concept Train Plan Comparison

5. Appendices

APPENDIX A. Services Flexed to Create a TPR Compliant Concept Train Plan

Monday to Friday (SX)

1B30TX Eastleigh to London Waterloo.

Arrives into Waterloo P9 vice P13 and at 0654 vice 0657. Pathing time removed to enable train to arrive earlier

2B06 retimed to depart Farnborough at to depart at 06:19:30 vice 06:18:30 to be headway compliant with 1B30TX. (2) also added approaching Clapham Jn to be headway compliant behind 1B30TX. 2B06 arrives into Waterloo 3 minutes later.

1B31TR London Waterloo to Southampton

(0:30) added approaching Wimbledon to be headway compliant with 2P15 preceding. (0:30) also added to 1L13 at New Malden to maintain headway behind 1B31.

1L13DC dwell at Salisbury reduced to 2 minutes FAB from Salisbury.

Dwell at Eastleigh increased to 07:30 to be headway compliant with 1W11 preceding.

OY73 departs 3 minutes later from Eastleigh East Yard to comply with Platform reoccupation at Eastleigh with 1B31. Dwell at Eastleigh reduced to 2 minutes and forward as booked from there.

Departs 2 minutes after the train offered in Dec 17 but arrives into Southampton at the same time. Arrives into Hook at 0804 vice 0802:30 due to time added to be headway compliant behind 2P15 between Clapham Jn and Woking. Arrives into Basingstoke at 0814:30 vice 0810:30 due to lack of platform availability (P1 occupied by 2L11CA/2L16Ca between 0757 and 0717. P2 occupied by 1L13DC between 0810:30 and 0812. Later arrivals into Winchester and Eastleigh as a result but arrives into Southampton as booked in Dec 17 due to pathing time removed approaching Southampton.

1W11 arrives in P2 vice 4 to allow 1B31 to arrive into P4. 1F10DB arrives into P3 vice 4 to allow 1B31 to arrive into P4

1B32CH Southampton to Waterloo

Departs 0820 vice 0824. A departure at 0824 is valid up to Eastleigh; however it causes multiple headway conflicts with several trains between Eastleigh and Clapham Jn.

1B33TX London Waterloo to Southampton

Departs at 1026 vice 1025 in Dec 17 but arrives 2 minutes earlier at 1158.

1L25 now Departs at 10:22 vice 10:25 to avoid conflict with 1B33 also departing at 10:25. 1L25 runs earlier due to 1B33 slowing down to crossover at Winchfield to stop at Hook. Stop at Salisbury increased to 09:30, as booked departing Salisbury.

1L26 (1) added approaching Waterloo to be Junction margin compliant with 1B33 departing Waterloo.

1B34TX Southampton to Waterloo

Departs at 1010 vice 1011 but arrives into London Waterloo 12 minutes earlier at 1145

1B35TZ London Waterloo to Southampton

Departure time 1 minute later at 1226, arrival time matches the Dec 17 times however arrival and departure times at Winchester and Eastleigh slightly differ due to other trains around at that time in the area.

1L33 departs at 1224 vice 1225 to avoid conflict with Alliance 1B35 departing at 1226.

1L34 arrives Waterloo 1 minute earlier to comply with earlier departure time of 1L33. 1A33 departs 1 minute later to be compliant with 1B35 at Clapham Jn.

1B36TZ Southampton to Waterloo

Arrives Clapham Jn at 1344:30 vice 1341:30 in Dec 17 to avoid headway conflict with 1A40CA.

1C53BP departure at 1214 vice 1213 to comply with 1B36 departure at 1212. (2) approaching St Denys reduced to 1 and as booked from there.

1M46 (1) added approaching Southampton to comply with Platform reoccupation at Southampton with 1B36. Dwell reduced by 1 minute, as booked departing Southampton.

1B37TX London Waterloo to Southampton

Departs Waterloo at the same time as Dec 17, arrives into Southampton 1 minute earlier.

1L41 Departs Waterloo at 1422 vice 1425 to avoid conflict with 1B37 departure at 1425. time added back in between Clapham Jn and dwell at Basingstoke increased so as booked departing Basingstoke.

1A41 (0:30) added approaching Clapham Jn to remain headway compliant behind 1B37. Dwell reduced to 1 minute at Surbiton as booked departing Surbiton.

1B38CH Southampton to Waterloo

Departs Southampton at 1421 vice 1424 in the Dec 17 timetable. Unable to depart at 1424 as headway conflict with 1B26 at Winchester. Unable to swap paths with 1B26 because this train departs from Poole.

1B39CH London Waterloo to Southampton

Departs Waterloo at 1630 vice 1627 arrives Southampton 1 minute earlier at 1750, option to swap paths with 1A49 to depart at 1627 but 1B39 will still arrive at 1750 due to traffic in the Basingstoke and Southampton area. Later departure kept to reduce journey time. 1E24 arrives Southampton 1 minute earlier, 1E25 departs 1 minute earlier with (1) removed approaching Northam Jn, dwell at Swanick increased by 3 minutes so back to booked departing Swanick, this is to avoid Junction Margin conflict with 1B39 at St Denys. 4O09, (14) approaching Eastleigh reduced to 7 to avoid headway conflict with 1B39. Arrives into Southampton MCT earlier at 1757. 1W47 (1) added approaching Southampton Airport Parkway to avoid headway conflict. Dwell at Bournemouth reduced by 1 minute so as booked departing Bournemouth.

1B40TX Southampton to Waterloo

Departs 2 minutes later at 1730 vice 1728, 1B32 currently departs at 1728, tried swapping paths but this causes conflict with 2B44 at Eastleigh. 2B44 Dwell at Eastleigh reduced to 5 minutes to free platform for 1B40

1B41TR London Waterloo to Southampton

Departs Waterloo at the same time as Dec 17, however arrives into Southampton 3 minutes later due to 2B65 arriving into Southampton at 2113. Unable to retime this to arrive any earlier.

2P68 (1) added approaching Woking Jn to be Junction margin compliant with 1B40
2L60 (1) added approaching Surbiton to be headway compliant behind retimed 2P68. (1B41)

1B42TR Southampton to Waterloo

Departs 2 minutes later at 1830 vice 1828, 1B34 currently departs at 1828, tried swapping paths but this causes conflict with 2B46 at Eastleigh.

2B44 Dwell at Eastleigh reduced to 5 minutes to free platform for 1B40

1B43TR London Waterloo to Southampton

Departs at 2032. 1W63 (2) added approaching Winchester to remain headway compliant behind 1B43. Dwell at Bournemouth reduced to 2 minutes and arrives into Weymouth as booked.

2W35 dwell at Southampton increased by 2 minutes to remain headway compliant behind retimed 1W63. Arrives Weymouth 2 minutes later.

1B50MT New path Southampton to London Waterloo

Departs Southampton at 0720 arrives into Waterloo P6 at 0839.

2B14 departs from Eastleigh 3 minutes earlier to free platform 1 up for 1B50.

1A20 dwell at Woking increased to 3 minutes to maintain compliant headway with 1B50. Arrives into Waterloo 2 minutes later.

1B51MT Waterloo to Southampton

Valid path, no amendments required to any trains.

1B52MT New Path Southampton to London Waterloo

No valid path available despite numerous options tested. Pathing impacts a minimum of 13 services due to insufficient breaks. Other options to run in paths of other services, specifically 1L56CA from Woking Jn (1L56CA to turnround at Salisbury or Andover), or in path of 1B30CA from Southampton with 1B30CA departing Poole earlier to provide connectivity.

1B53MT New Path London Waterloo to Southampton

Departs Waterloo at 1755. 1L55 now departs at 1753 vice 1755, dwell at Basingstoke increased to 03:30, departs Basingstoke as booked. To solve headway issues between Clapham Jn and Woking the following trains have been amended
2F91 (0:30) added approaching Clapham Jn. (3) approaching Woking reduced to (2:30) as booked arriving into Woking.

2P65 (0:30) added approaching Clapham Jn (1) added approaching Woking, dwell at Woking reduced to 1:30. Departs Woking as booked.

2L61 (0:30) added approaching Clapham Jn and Woking. Arrives into Basingstoke 1 minute later

2G91, departs Waterloo 1 minute earlier, dwell at Surbiton increased by 1 minute departs Surbiton as booked.

2P63, departs Waterloo 1 minute earlier, (1) added approaching Surbiton so as booked from there

1T51, departs Waterloo 1 minute earlier, (1) added approaching Surbiton so as booked from there

1W51, departs Waterloo 1 minute earlier, (1) added approaching Surbiton so as booked from there

5B30TX Eastleigh TRSMD to Eastleigh

Departs 0516

5B31CH Southampton to Up Goods Loop

Departs 0915 to avoid clashes departing Southampton

5B32CH Eastleigh TRSMD to Southampton

Departs at 07:26 vice 07:39 to avoid headway conflict with 2B31 between Eastleigh and Southampton Airport Parkway.

6O66 (3) added approaching Eastleigh to avoid headway conflict with 5B32. (6) approaching St Denys reduced to (3), as booked from St Denys.

4M33/4E33 platform change from 4 to 3 at Southampton to allow arrival of 5B32.

5B34CH Up Goods Loop to Southampton

Valid path, no amendments required to any trains.

5B36CH Southampton to Southampton (via Up Goods Loop)

Departs 1200 vice 1203 to avoid conflict with 1F09 arriving into Southampton from Millbrook at 1203:30. As a consequence 2W15 departs Southampton 2 minutes earlier to avoid headway conflict with retimed 5B36. (2) added back approaching Redbridge so as booked arriving into Totton.

5B37CH Southampton to Southampton (via Down Loop)

Valid path, no amendments required to any trains.

5B38CH Southampton to Southampton (via Up Goods Loop)

2W19 departs Southampton 2 minutes earlier to avoid headway conflict with 5B38. (2) added back approaching Redbridge so as booked arriving into Totton.

5B41CH Southampton to Eastleigh TRSMD

Train now planned into Southampton Up Goods Loop and dwells there for 22:30 minutes before departing for Eastleigh. This is to find a compliant path to Eastleigh and also avoids platform conflicts with other services at Eastleigh.

5B42CH Southampton to Southampton (via Up Goods Loop)

Valid path, no amendments required to any trains.

5B43CH Southampton to Eastleigh TRSMD

Valid path, no amendments required to any trains.

Saturday (SO)

1B30GS Southampton to London Waterloo

Departs at 0543 vice 0552 in Dec 17. 2L08, dwell at Woking and Surbiton reduced by 30 seconds to enable 1B30 to follow headway compliantly between Surbiton and Clapham Jn. (1) added approaching Clapham Jn so arrives into Waterloo as booked.

1B31GS London Waterloo to Southampton Central

Departs at 0755. 1L15 now departs at 0753 vice 0755 as 1B31 slows down to stop at Hook the earlier departure for 1L55 is a clear run without having to be pathed behind 1B31 slowing down to move from FL to SL.

1B32GS

Departs 0817 vice 0824 due to clashes with 1M30 and 2B26 departing Southampton. Earlier departure gives 1B32 a clear path to Eastleigh. Dwell at Basingstoke increased to 4 minutes to follow 1B12 compliantly at Winchfield London End on the UF

1B33GS London Waterloo to Southampton

Departs at 1026 vice 1025 in Dec 17 but arrives 2 minutes earlier at 1158.

1L25 now Departs at 10:22 vice 10:25 to avoid conflict with 1B33 also departing at 10:25. 1L25 runs earlier due to 1B33 slowing down to crossover at Winchfield to stop at Hook. Stop at Salisbury increased to 09:30, as booked departing Salisbury.

1L26 (1) added approaching Waterloo to be Junction margin compliant with 1B33 departing Waterloo.

1A25 (0:30) added approaching Clapham Jn to avoid headway conflict with 1B33. Dwell at Farnham reduced by 0:30 so departs Farnham as booked. Matches path SX.

1B34 Southampton to London Waterloo

Departs at 0951 vice 0950 in Dec 17. 2L24 dwell at Woking and Surbiton reduced by 30 seconds to enable 1B34 to follow headway compliantly between Surbiton and Clapham Jn. (1) added approaching Clapham Jn so arrives into Waterloo as booked.

1B35GS London Waterloo to Southampton

Departure at 1226, arrival time matches the Dec 17 times however arrival and departure times at Winchester and Eastleigh slightly differ due to other trains around at that time in the area.

1L33 departs at 1224 vice 1225 to avoid conflict with Alliance 1B35 departing at 1226.

1L34 arrives Waterloo 1 minute earlier to comply with earlier departure time of 1L33. 1A33 departs 1 minute later to be compliant with 1B35 at Clapham Jn. Path matches with SX path.

1B36GS Southampton to Waterloo

Arrives Clapham Jn at 1344:30 vice 1341:30 in Dec 17 to avoid headway conflict with 1A40CA.

1C53BT departure at 1214 vice 1213 to comply with 1B36 departure at 1212. (2) approaching St Denys reduced to 1 and as booked from there.

1M46 (1) added approaching Southampton to comply with Platform reoccupation at Southampton with 1B36. Dwell reduced by 1 minute, as booked departing Southampton.

Matches SX path and arrives Waterloo at the same time as SX but difference in departure time at Eastleigh.

1B37GS London Waterloo to Southampton

Departs Waterloo at the same time as Dec 17, arrives into Southampton 1 minute earlier.

1L41 Departs Waterloo at 1422 vice 1425 to avoid conflict with 1B37 departure at 1425. time added back in between Clapham Jn and dwell at Basingstoke increased so as booked departing Basingstoke.

1A41 (0:30) added approaching Clapham Jn to remain headway compliant behind 1B37.

Dwell reduced to 1 minute at Surbiton as booked departing Surbiton.

Matches SX path.

1B38CH Southampton to Waterloo

Departs Southampton at 1421. As a result of this 2B38 departs Southampton at 1430 vice 1422 Dwell at Eastleigh reduced and arrives into Waterloo 2 minutes later. 1P50 and 1W44 has had (2) added approaching Clapham Jn each to remain headway compliant with the later departure from Clapham Jn of 2B38

1M54 also departs Southampton 1418 vice 1420 to comply with 1B38 departure. Dwell at Winchester extended so back to booked departing Winchester.

Matches SX path.

1B39CH London Waterloo to Southampton

Departs Waterloo at 1630 arrives into Southampton later than SX version due to stopping at Hook and pathing around other trains between Basingstoke and Southampton.

1B40GS Southampton to Waterloo

Departs at 1644, arrives Waterloo at 1815. 1B33 departure amended 1 minute later at 1816

to comply with 1B40 arrival. 1B33 1 minute later throughout its journey.

1B41GS London Waterloo to Southampton

Departs Waterloo at 1831 vice 1825 in Dec 17, this departure gives a clear path between Waterloo and Southampton. 6O42 dwell at Wallers Ash loop reduced to comply with 1B41, dwell at Eastleigh extended so back to booked to destination.

1B42GS Southampton to Waterloo

Departs 2 minutes later at 1830 vice 1828, 1B34 currently departs at 1828, tried swapping paths but this causes conflict with 2B46 at Eastleigh.

2B44 Dwell at Eastleigh reduced to 5 minutes to free platform for 1B42

2L58 dwell at Surbiton reduced to 1 minute to be headway compliant in front of 2B46 time added back in at Clapham Jn so arrives as booked.

1B43GS London Waterloo to Southampton

Departs at 2032. 1W63 (2) added approaching Winchester to remain headway compliant behind 1B43. Dwell at Bournemouth reduced to 2 minutes and arrives into Weymouth as booked.

2W35 dwell at Southampton increased by 2 minutes to remain headway compliant behind retimed 1W63. Arrives Weymouth 2 minutes later.

5B32GS Eastleigh TRSMD to Southampton

Departs Eastleigh TRSMD earlier at 0736, this is to cater for earlier departure of 1B32.

1F08 now uses P4 at Southampton as 5B32/1B32 in P 2

5B30GS Eastleigh TRSMD to Southampton

Valid path, no amendments required to any trains.

5B31GS Southampton to Southampton (via Up Goods Loop)

Valid path, no amendments required to any trains.

5B35GS Southampton to Southampton (via Up Goods Loop)

Valid path, no amendments required to any trains.

5B41CH Southampton to Eastleigh TRSMD

Valid path, no amendments required to any trains.

5B42CH Southampton to Southampton (via Up Goods Loop)

Valid path, no amendments required to any trains.

5B43GS Southampton to Eastleigh TRSMD

Valid path, no amendments required to any trains.

Sunday (Su)

1B30GS 0842 Southampton to Waterloo

First available path from Southampton that does not affect other paths departing Southampton. There are 3 consecutive departures from Southampton at 0825, 0827 and 0831. An earlier departure causes issues along for the path particularly at Clapham Jn where it would be non headway compliant with 1P26 preceding.

1B31GS 1030 Waterloo to Southampton

Path found with no changes required to other trains.

1B32GS 1039 Southampton to Waterloo

Longer dwell at Basingstoke to be headway compliant following 2L36 between Basingstoke and Hook, unable to get in front of 2L36 due to lack of platform arriving into Basingstoke. Time added between Woking and Waterloo to be headway compliant behind 1P34.

Earlier departure compared to other Southampton departures to be headway compliant in front of 6M38 at Eastleigh.

1B33GS 1230 Waterloo to Southampton

2S37 dwell at Eastleigh extended by 1 minute to comply with 1B33 preceding at Southampton airport parkway. dwell at Southampton Central reduced by 1 minute so departs Southampton as booked.

1B34GS 1242 Southampton to Waterloo

Departure from Southampton at this time due to platform availability at Southampton.

1A44 dwell at Surbiton increased by 30 seconds (00:30) to comply with headway following 1B34, removed approaching Clapham Jn so arrives Clapham Jn as booked.

1B35GS 1433 Waterloo to Southampton

can depart Waterloo at 1430 but will have time added approaching Clapham Jn to be headway compliant behind 1A41 departure delayed until 1430 to reduce journey time.

1B36GS 1442 Southampton to Waterloo

1A52 dwell at Surbiton increased by 30 seconds to be headway compliant with 1B38.

1B37GS 1633 Waterloo to Southampton

1W51 moved from P2 to P1 at Basingstoke to avoid clash with 1B37.

1B38GS 1642 Southampton to Waterloo

1A60 dwell at Surbiton increased by 30 seconds to be headway compliant with 1B38 preceding at Wimbledon. (0:30) removed approaching Clapham Jn so arrives into Clapham Jn as booked.

1B55 Retimed to depart 1 minute later at 1816 to comply with 1B38 arriving into Waterloo at 1815.

1B39GS 1833 Waterloo to Waterloo

1W59 Platform change at Basingstoke from 2 to 1 to comply with 1B39.

1B40GS 1842 Southampton to Waterloo

1A68 Dwell at Surbiton increased by 30 seconds to remain headway compliant behind 1B40. (0:30) removed approaching Clapham Jn so arrival into Clapham unaffected.

1B63 retimed 1 minute later throughout to comply with 1B40 arrival into Waterloo.

1B41GS 2033 Waterloo to Southampton

1W67 Platform change from 2 to 1 at Basingstoke to avoid clash with 1B41 at Basingstoke.

1B42GS 2042 Southampton to Waterloo

No changes to other trains.

1B43GS 2233 Waterloo to Southampton

No changes to other trains.

5B30GS 0748 Eastleigh TRSMD to Southampton

Departs Eastleigh TRSMD at 0748, this is the first available path following lifting of section 4 possession SW135.1

5B32GS 0948 Eastleigh TRSMD to Southampton

Departs Eastleigh TRSMD 2 hrs after departure of 5B30 to keep 2 hourly pattern.

5B34CH, 5B36CH, 5B38CH, 5B40CH, 5B42CH Southampton to Southampton (via Southampton Goods Loop)

Shunt moves no changes to other trains.

5B41CH 2210 Southampton to Eastleigh TRSMD

Empty back to Eastleigh TRSMD, no changes to other trains.