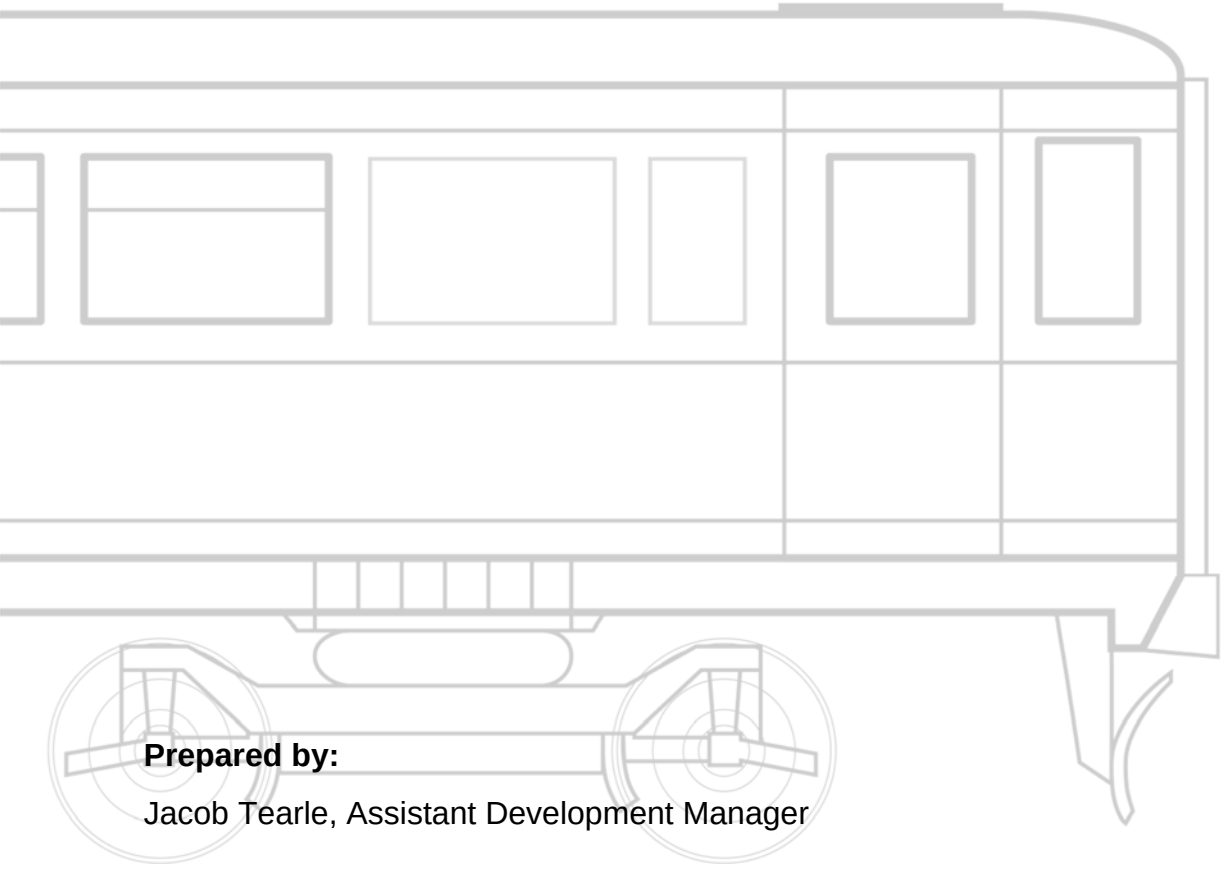
Guildford Land and Rail Study

6th December 2018



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Glossary		
Acronym	Name	Definition
-	Solum Regeneration (Guildford)	Joint venture between Network Rail and Kier Group to look into building new homes at railway stations.
-	Main Line Services	Services that operate on the mainline either fast or semi-fast
-	Main Suburban Services	Services that operate to Guildford via Cobham
-	Up Services	Services Towards London (or Reading in the case of the North Downs Line)
-	Down Services	Services travelling away from London (or Reading in the case of the North Downs Line)
CP10	Control Period 10	Network Rail Planning Period between 2039 and 2044
CP5	Control Period 5	Network Rail planning period between 2014 and 2019
CP6	Control Period 6	Network Rail planning period between 2019 and 2024
CP7	Control Period 7	Network Rail planning period between 2024 and 2029
CP8	Control Period 8	Network Rail planning period between 2029 and 2034
CP9	Control Period 9	Network Rail Planning Period between 2034 and 2039
DfT	Department for Transport	Government department responsible for transport across England.
GBC	Guildford Borough Council	Local authority responsible for the Guildford area

MDU	Maintenance Delivery Unit	Strategically placed network of depots where maintenance to the railway is carried out from
NDL	North Downs Line	Services that operate on the North Downs Line between Reading and Redhill/Gatwick Airport via Guildford
ORR	Office of Rail and Road	Regulator of the rail industry
ROC	Rail Operating Centre	Building where Network Rail centrally controls and signals trains across a regional area.
RSCH	Royal Surrey County Hospital	Hospital in Guildford
S&C	Switches and Crossings	The areas of track which trains use to cross lines.
SRLtH	Southern Rail Link to Heathrow	Project looking into options for linking Surrey and Hampshire with Heathrow Airport
TPH	Train per Hour	How many trains operate per hour
TPR	Train Planning Rules	TPRs are the rules by which a timetable is built; rules include the amount of time after a train has left a platform that the platform can be reoccupied, and similarly, there is a rule about the amount time after a train has crossed a junction that another train can cross it. These rules are important in maintaining the safe operation of the railway as well as enabling the resultant timetable to be operated robustly.
TPS	Train Planning System	System that Network Rail uses to plan trains
WACE	Woking Area Capacity Enhancement	Major project to redevelop Woking station and construct a grade seperated junction.
WTT	Working Time Table	The core national rail timetable

Contents

Part A: **Executive Summary**

A.01 Summary

The aim of this study has been to provide Guildford Borough Council with an understanding of what land is required for railway operational use and future passenger growth at Guildford Station, and therefore what land may be available for development.

The need to provide more residential accommodation close to transport hubs has become more important in recent years. Guildford Borough Council and Network Rail are therefore committed to identifying potential land sites that may be appropriate for such use.

This study has sought the answers to the following questions:

- What is the future platform requirement to accommodate demand in the planning period to 2043?
- What is the operational land requirement in the Guildford area; including sites such as the Maintenance Delivery Unit (MDU) and the signal box location etc.?
- What are the renewals plans for all assets groups in the Guildford area; with emphasis on structures and track infrastructure?
- What Network Rail land is not required for operational purposes and could therefore be released for development?
- How can the passenger experience be improved to provide a station fit for the future that meets the needs of passengers and can accommodate future demand?

To answer these questions four workstreams were undertaken; these were:

1. Analysis of pedestrian flows and capacity at Guildford Station
2. Timetable analysis to identify what level of train service the station can handle and at what point additional infrastructure is required to accommodate the deliver the desired service level
3. A technical study that took the output of the pedestrian and timetable studies and developed options for providing the required capacity and operational outputs at Guildford
4. Identification of complementary measures that would improve the customer experience at the station

The main conclusions are detailed in section C.06, and throughout the document, but are also summarised below:

- The Solum development will be delivered with Control Period 6 (CP6), and will provide a new station building and new plaza on the east side of the station site
- Platform 0 is not required to meet future capacity demand
- A new platform will be required on the west side of the station to meet the growth expected from the release of Main Line train paths through the implementation of Crossrail 2 in Control Period 8 and beyond (CP8+)
- A new, wider and fully accessible footbridge will be required to accommodate the increase in passenger demand at the station
- The signal box site will not become available for development
- The Maintenance Delivery Unit (MDU) site is the most likely for future development, although until the Wessex Route Accommodation Strategy and the subsequent consultation with trade unions is complete this cannot be confirmed or be assumed to happen
- There are several packages of complementary measures that provide an opportunity for Guildford Borough Council and Network Rail to work together to realise passenger experience benefits at Guildford Station

Part B: **Background**

B.01 Rationale

This study has been undertaken by Network Rail on behalf of Guildford Borough Council, who have funded the work. Guildford Borough Council instigated this study to understand what land around Guildford Station could become available for future development and when. To identify any land that might be available for development, it was agreed that Network Rail would need to understand what was required for operational use and future growth at the station.

The Wessex Route Study was published in August 2015 and provided a high-level understanding of what may be required at Guildford to meet future growth in the planning period to 2043. Because of the work carried out through the Route Study it was understood that it was unlikely that any capacity provision works would be required at Guildford until at least the Control Period 7 (CP7) timeframe of 2024 to 2029. Therefore, Network Rail would be unlikely to seek or receive further Government funding to progress anymore

development work to ascertain what exactly would be required at Guildford Station in the future until a much later date.

Guildford Borough Council therefore offered to bring forward and fund the capacity study work so that Network Rail could discern a red line boundary showing what land was needed in the future for railway purposes. This would then inform a decision on what land might be available for future development and at what point.

B.02 Guildford Station: an overview

Guildford Station is an eight-platform station (although only seven of the platforms can be used for passenger services owing to the single track between platforms 6 and 7) on the Main Line route from Portsmouth, known as the Portsmouth Direct Line. In April 2018 the station was brought into Network Rail's Managed Station portfolio, and therefore taken out of the SW franchise.

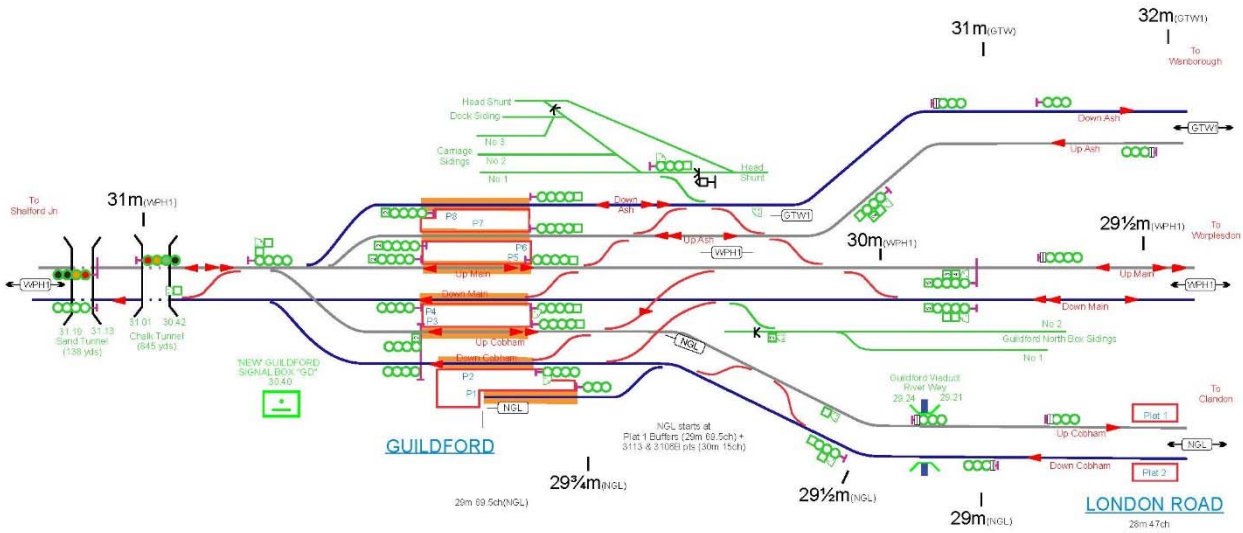

Figure 1: Guildford Station Track Diagram

Passenger statistics reveal that the station has 8,192,104 “entrances and exits” and 1,105,291 “interchanges” per year, (“Estimates of Station Usage 2016-17” from the Office of Rail and Road).

To the north of the station the largely non-electrified North Downs Line, which provides the rail link between Reading and Gatwick Airport, comes in on the west side. Also to the north but coming in on the east side is the ‘Guildford New Line’, which splits and Effingham Junction with some services to London operating via Surbiton and others via Epsom.

To the south of the station is Chalk Tunnel through which the Portsmouth Direct line continues towards Portsmouth with the North Downs Line diverging off at Shalford Junction.

The station has two entrance/ exits, one on the east side (the main access to the station), and one on the west side. The west side entrance/ exit is directly connected to the platforms via a footbridge; this is also a public right of way and access can be gained at the gatelines where passes are issued. The bridge is not step free as there are no lifts and on the west side there are a few steps up to the entrance/ exit. See the aerial view of the station in *Figure 2*.

Figure 2: Guildford Station footbridge from above (Guildford Park Road on the left)

However, the station does have a subway, with ramps, which connects all the platforms to the main entrance/ exit on the east side. It should be noted that the subway ramps are both steep and long; meaning they are not compliant with modern design standards. See *Figure 3*.

Figure 3: Guildford Station subway between platforms

The railway system within the station is fully electrified with third rail 750 volts direct current electrification.

Platforms are of varying lengths that can accommodate trains of between 10-car and 12-car lengths. A summary of the platform length and the associated number of train car lengths supported are provided in *Table 1*.

Platform Number	Published length (m)	Number of train cars supported
1	211	10
2	256	12 (downline); 8 (upline)
3	256	12
4, 5	255	12
6	264	12
7	263	12
8	208	10

Table 1: Guildford station platform lengths

There are three carriage sidings located adjacent to Platform 8 on the west side of the station, see *Figure 4*.

Figure 4: west side sidings

Farnham Road Bridge is located at the country end of the station and carries a two-lane carriageway over the railway, see *Figure 5*.

Figure 5: Farnham Road Bridge

There is an access road that passes beneath Farnham Road Bridge, which allows access from Guildford Park Road to a multi-storey car park located at the southern end of the station.

Figure 6: : Farnham Road Bridge and access road to Farnham Road car park

The permissible line speeds through Guildford South Junction are 25mph with the line speeds increasing to 90mph to the north end of the station on the lines towards Woking.

The line speeds are shown in *Figure 7* which has been extracted from the National Electronic Sectional Appendix (NESA).

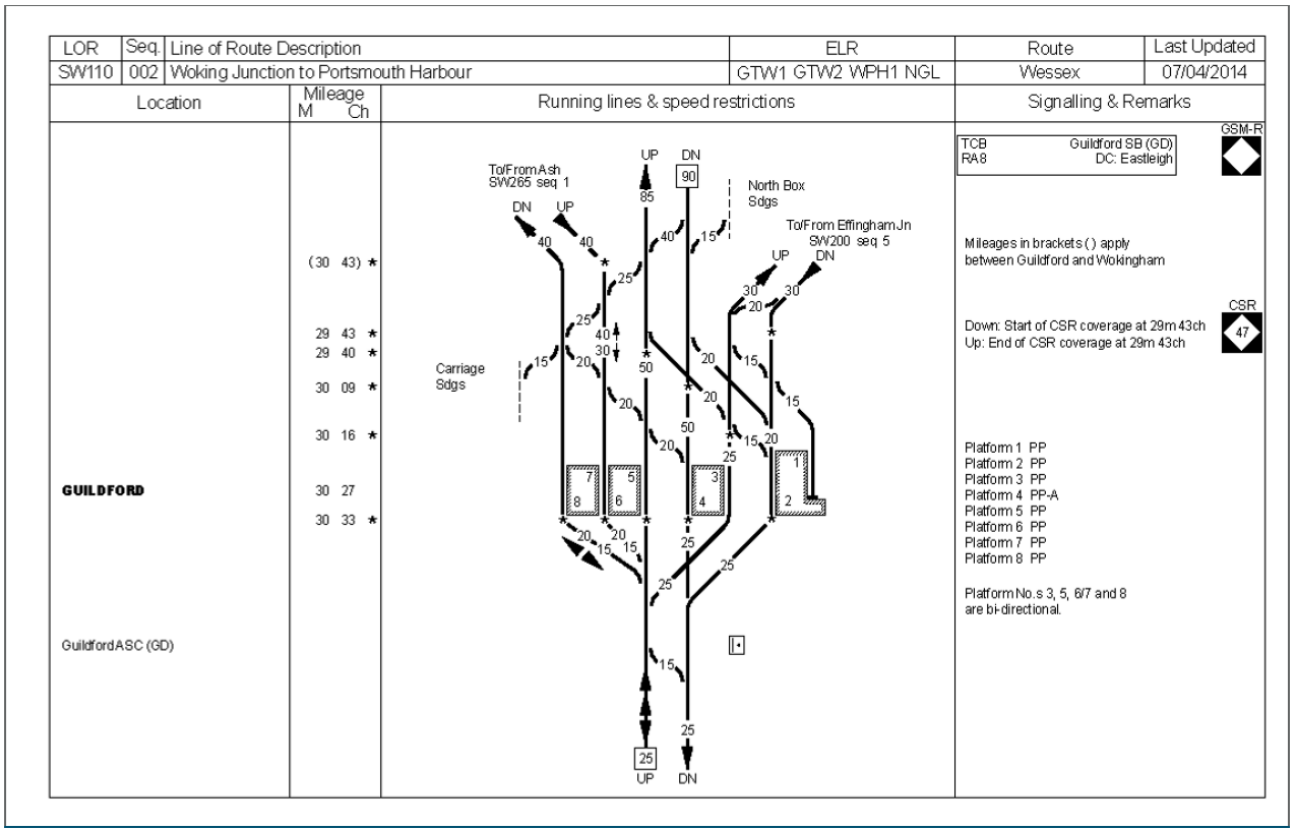

Figure 7: Extract from the National Electronic Sectional Appendix (NESA)

The station is surrounded by several heritage and conservation features. These include the Guildford Town Centre Conservation Area and Wey and Godalming Navigations Conservation Area. It should be noted that the conservation areas are outside the Network Rail ownership boundary. *See Figure 8*.

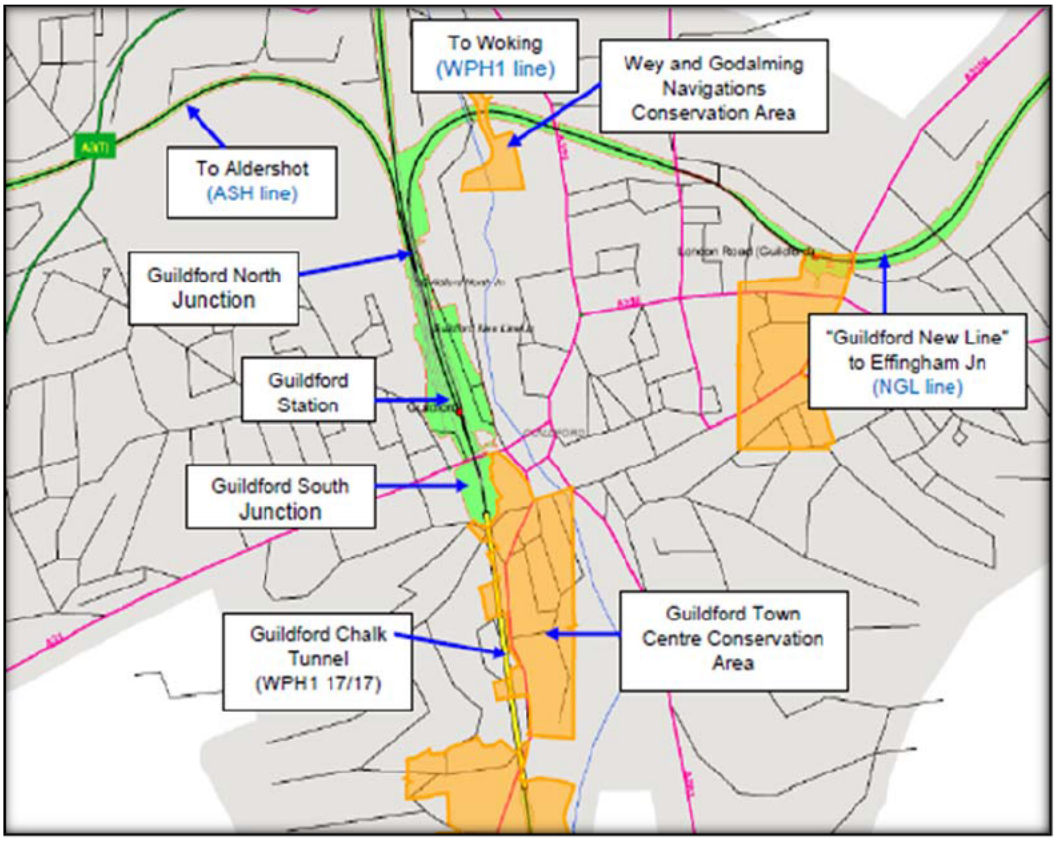

Figure 8: Guildford station area including conservation areas

To the west of the station is the Network Rail Maintenance Delivery Unit (MDU) and a car park. Further information on the station lease areas, NR ownership boundary and maintenance delivery unit are provided in *Figure 9*.

The east side of Guildford Station and the station buildings are being redeveloped as part of the wider Solum scheme. This will be a complete transformation of the east side of the station. The Solum development provides the opportunity for Guildford Borough Council, Solum, South Western Railway and Network Rail to work together to improve the public realm and access to the station from the town centre.

Figure 9: Guildford station layout (red- station lease boundary; green-NR operational land; blue- maintenance delivery unit)

In terms of train service, the station is served in the off-peak by:

- Two fast trains per hour in each direction between London and Portsmouth
- Two slower services in each direction per hour between London and Haslemere, one of which extends to Portsmouth
- The North Downs Line offers two trains per hour in each direction between Reading and Redhill, one slow and one semi-fast service which extends to Gatwick Airport
- Four trains per hour to London Waterloo via Effingham Junction, two via Surbiton and two via Epsom
- Two trains per hour to Ascot, via Aldershot and Camberley

During peak times the above services are supplemented by services via Sutton to London Bridge and additional Portsmouth line services.

B.03 Previous Work

B.03.01 Wessex Route Study

As stated in the Rationale, above, the Wessex Route Study was the first piece of work that sought to identify a future requirement for capacity works at Guildford, and was published in August 2015. The study was produced with the collaboration of other industry partners and the input of Local Authorities and Local Enterprise Partnerships (LEPs).

The aim of the Route Study was to set out a strategy for the Wessex Route that addressed overcrowding, growth (both in passenger and freight demand), journey times and connectivity. As part of the work looking at Main Line service growth, in the planning period to 2043, it was recognised that at some point in that timeframe Guildford Station would be unable to cope with the level of service required to meet demand.

Initial work, as published in the Draft for Consultation (public consultation), suggested a large-scale remodelling of Guildford Station to accommodate:

- Current overcrowding on Main Line services
- Growth in demand on Main Line services
- Growth in North Downs Line services
- New off-peak services to meet connectivity outputs

This was very much a “worse case” scenario and resulted in a solution that required a substantial remodelling of the station through the addition of three new platforms (on the west side of the station), a fully accessible bridge and considerable track works.

Development of this scenario pointed to there being no requirement for increased platform capacity in the Control Period 6 (CP6) timeframe of 2019 to 2024. It was stated that the capability to operate additional services in CP7 or beyond through the release of train paths from Digital Railways and Crossrail 2 would be the point at which an intervention at Guildford Station would be required. It was, however, not clear when such an intervention would be needed.

Following the public consultation and owing to the changing financial landscape it was decided that this “worse case” was not a value for money solution and that for the final document a short-term incremental step towards capacity provision should be identified. This led to the proposal to build a Platform 0 on the east side of the station. For the Wessex Route Study this was suggested but not in any specific detail. It was decided that further work, to a pre-GRIP level would be carried to understand the technical feasibility of a Platform 0. No timetable analysis was done at the time of the Wessex Route Study to definitively show if a Platform 0 was the interim solution to capacity through Guildford.

Platform 0 technical feasibility

Following the publication of the Wessex Route Study and the progression of the Solum property development, on the east side of the station, it was decided that some technical feasibility work would be required to identify the land required to implement a Platform 0.

The premise behind a Platform 0 at Guildford Station was that Platform 2, a through platform, is blocked by terminating Main Suburban services that use the Guildford New Line. This means that Platform 1 and Platform 2 are both occupied by terminating trains. For Platform 1, which is a bay platform, this is not a problem, but for Platform 2 it was suggested that if there was no terminating service occupying the platform then it could be used for services operating towards Portsmouth. It should be noted that this was not based on any detailed timetable analysis.

As the Solum development progressed through the planning process it became apparent that Network Rail would need to supply Solum with a red line boundary for where a Platform 0 would be positioned.

Initial work suggested options that required varying amounts of land from the Solum development to accommodate the additional platform to the east of Platform 1.

Following further discussions with Solum about the impact on their development it was agreed that further options, that minimised or removed the need to use Solum designated land, would be assessed. This resulted in options that would require more expensive and intrusive railway works to fit the platforms and track layout into the space available.

Part C: **Guildford Land & Rail Study**

As previously noted, this study has been commissioned by Guildford Borough Council to enable Network Rail to assess future platform capacity, station capacity, and operational requirements with the aim of determining the land that could be released for development.

This study, as specified and remitted by Guildford Borough Council, has focused on the following questions:

- What is the future platform requirement to accommodate demand in the planning period to 2043?
- What is the operational land requirement in the Guildford area; including sites such as the Maintenance Delivery Unit (MDU) and the signal box location etc.?
- What are the renewals plans for all assets groups in the Guildford area; with emphasis on structures and track infrastructure?
- What Network Rail land is not required for operational purposes and could therefore be released for development?
- How can the passenger experience be improved to provide a station fit for the future that meets the needs of passengers and can accommodate future demand?

To answer these questions four workstreams were undertaken; these were:

1. Analysis of pedestrian flows and capacity at Guildford Station
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4. Identification of complementary measures that would improve the customer experience at the station

The following sections of this study will summarise the outcome of the these workstreams but it is worth discussing future growth and demand at Guildford first.

C.01 Demand and Growth

When assessing demand and growth on the railway it is assumed that the busiest hour is the “high peak”, therefore it is that hour that is used to understand capacity gaps and future

capacity requirements. The high peak is defined as arrivals into London Waterloo between 08:00 and 08:59.

The Wessex Route Study stated that in the planning period to 2043 there is expected to be a 40% increase in demand for Main Line high peak services (including those operating through Guildford on the Portsmouth Direct Line). In addition to this there is already 20% overcrowding on Main Line peak services, meaning that by 2043 an increase in capacity of 60% will need to be accommodated into London Waterloo. This equates to an additional 13 trains per hour (tph), 12-car in length, operating into London Waterloo in the high peak hour by 2043, split over all Main Line routes. Growth and increased demand on Main Line services is the largest capacity issue on the Wessex Route.

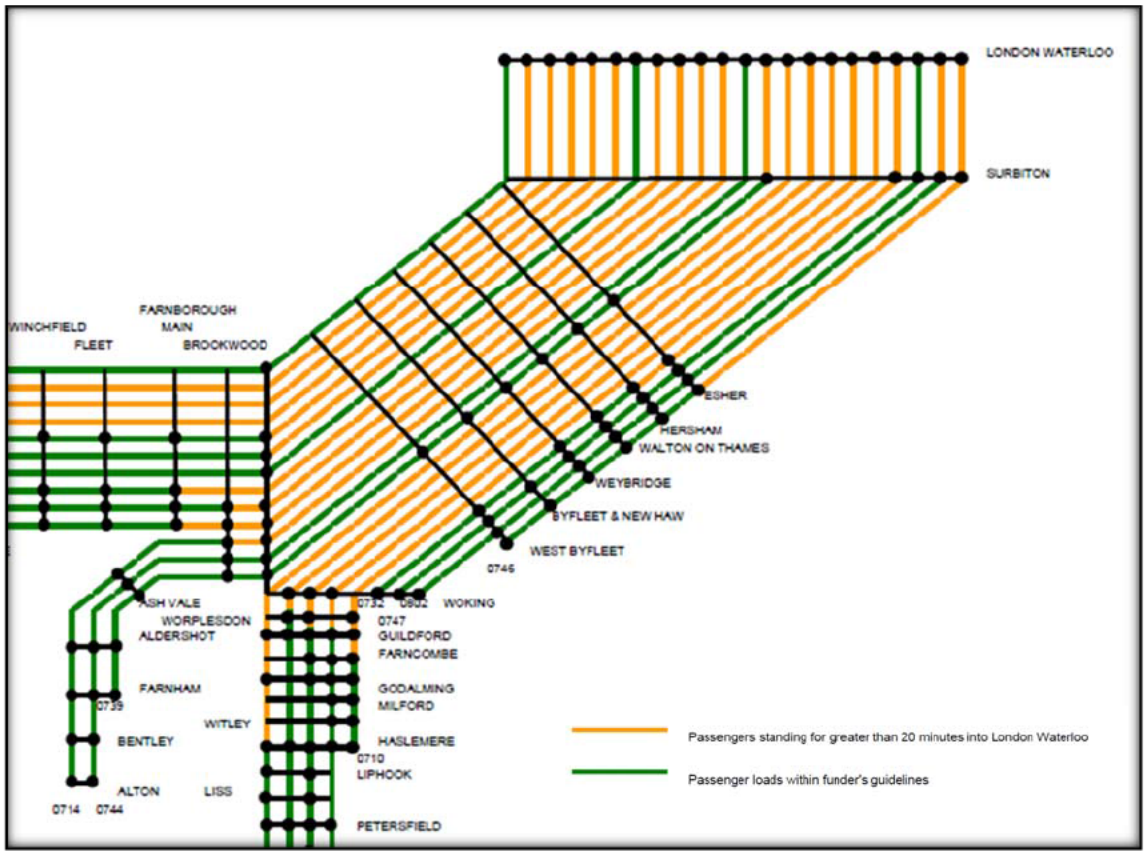


Figure 10: Extract from Wessex Route Study showing services where Main Line passengers are standing for over 20 minutes (shown in yellow and based on the 2013 position)

As well as Main Line services, Guildford also has Main Suburban services that start and terminate at the station. Demand and growth for the whole Main Suburban service group (not specifically Guildford), above the 8-car to 10-car uplift in capacity already delivered, is also assumed to be 40%, as stated in the Route Study. Most of this growth is expected closer to London and will be met by Crossrail 2, subject to funding. Increasing the number

of Main Suburban services at Guildford is not part of Network Rail's current strategy for the Main Suburban service group.

Demand on the North Downs Line is increasing and the line is seen, by wider stakeholders, as a major contributor to and enabler of economic growth. The strategy for the North Downs Line states that an uplift of service to 3tph all is day is required in early CP6 (formed of 2tph Reading to Gatwick Airport services and 1tph Reading to Redhill service). Following this uplift, it is expected that between Control Period 8 (CP8 – 2029 to 2034) and Control Period 10 (CP10 – 2039 to 2044) the service level would increase to 4tph, although it has not yet been determined where the additional service would operate to/ from.

Finally, the proposed Southern Rail Link to Heathrow is currently assumed to include a 2tph service operating between Guildford and Heathrow. Network Rail are working with DfT on the Market Led Proposal initiative in relation to linking Heathrow to rail from the south. There is currently no firm plan for Heathrow services but market study work carried out by Network Rail has suggested Guildford, and the surrounding catchment, as a key market for such a service.

From this demand and expected growth picture a train service specification was developed to be used when assessing capacity, both pedestrian and platform, at Guildford. This can be seen in *Table 2*.

The service specification acknowledges the Main Line services that are assumed as part of current Main Line strategy. Therefore, it includes additional services enabled by Woking grade separation, digital signalling and Crossrail 2. The specification also acknowledges the expected services to Heathrow and growth on the North Downs Line. This train service specification recognises the quantum of services but it is understood that there are variations both in terms of the services themselves and the timescales over which they are likely to be introduced.

Control Period	Service level change
CP6	One additional Main Line service in the high peak, released by the delivery of Woking Area Capacity Enhancement (WACE). It is currently assumed that this will originate from Haslemere. One additional North Downs Line train per hour in each direction, all day (to make 3tph). It is assumed this will be an additional service operating between Reading and Gatwick Airport.
CP7	Two additional Main Line services in the high peak, released by the implementation of digital signalling in the Wimbledon signalling area. It is assumed one of these will start at Havant and the other will start at Guildford. Two new Southern Rail Link to Heathrow services per hour in each direction. It is assumed this will start/ terminate at Guildford. (*NB: it is more likely that if Southern Rail Link to Heathrow is progressed then the services will be operated from CP8, but for train planning "worst" case purposes they were included in CP7*)
CP8 to CP10	Three additional Main Line services in the high peak, released by the delivery of Crossrail 2. It is assumed that these services will call at but not terminate at Guildford, although their exact destination/ origin has not yet been determined. One additional North Downs Line train per hour in each direction, all day (to make 4tph). No assumption was made on where this service operates to, but it was assumed it called at Guildford.

Table 2: future train service specification for Guildford

It is this service specification that has formed the basis of the pedestrian capacity and timetable analysis workstreams.

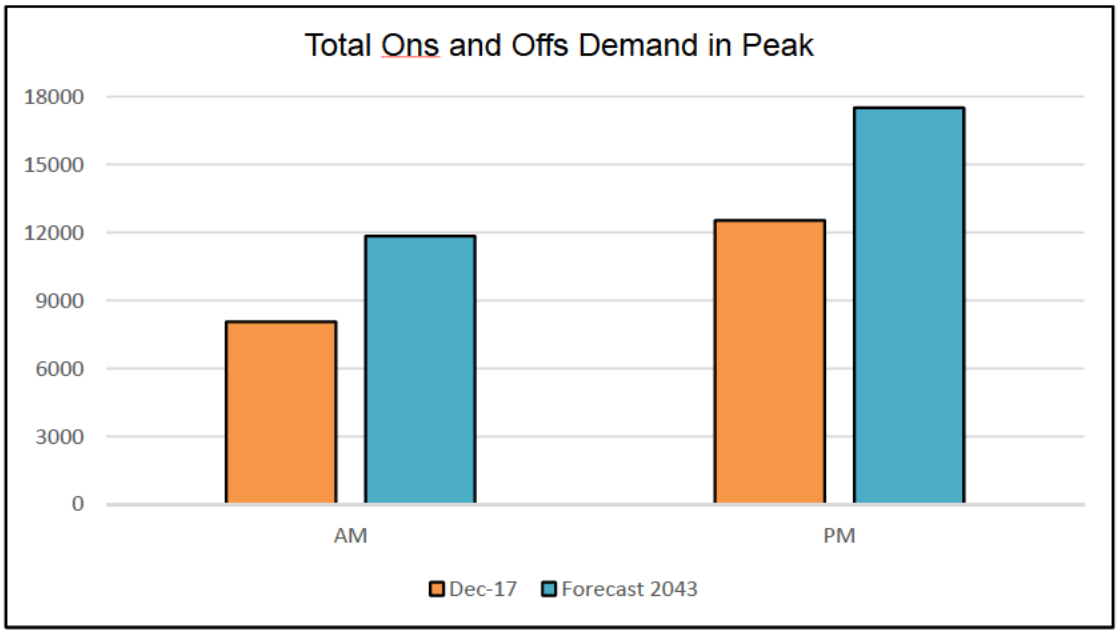
C.02 Pedestrian Capacity Analysis

The project commissioned some pedestrian capacity analysis to identify the pedestrian capacity requirements at Guildford Station needed to accommodate forecasted passenger demand in 2043, as set out in C.01. This workstream was carried out by the Station Pedestrian Capacity team in the System Operator function of Network Rail.

When we talk about pedestrian capacity analysis we are looking to understand how passengers move around the station, where the constraints are (or will be) to unimpeded movement, how to improve accessibility and what solutions might be required to improve the experience of passengers as they navigate the station. This section seeks to summarise the findings of the pedestrian capacity workstream.

Owing to the range of different service groups in operation at Guildford, both interchange passengers and those travelling to and from Guildford use the station. This means, large numbers of passengers pass through during peak periods making passenger flows complicated.

This analysis used the forecasted peak demand for 2043, whereby services and passenger numbers are expected to increase in line with C.01.



Graph 1: Total Ons and Offs in the AM (06:30-09:30) and PM (16:00-20:00) peak

For detailed figures see *table 4* and *table 5* in the pedestrian capacity report, located in Appendix C of this document.

After assessing both current issues and future station demand, this study identified the potential areas of capacity concern at Guildford station in 2043. These have been given a 'significant', 'moderate', or 'minor/no potential capacity concern' label, as represented in *Figure 11*.

Figure 11: Station Capacity Summary with 2043 Forecast Demand

C.02.01 Footbridge

The footbridge is quite narrow in width which leads to limited run-off at the tops of the stairs, meaning that there is little manoeuvrability for pedestrians on the footbridge. The fact that the footbridge is also a public right of way means that there are additional pedestrian journeys being made across the bridge that are unrelated to rail use. Both the dimensions of the footbridge and its dual use mean that at certain times there are already current congestion issues.

Once the 2043 demand is overlaid these congestion issues reach proportions that mean the footbridge is labelled on *Figure 5* as presenting a 'significant potential capacity concern', as a consequence of the increase in both rail passengers and additional non-rail pedestrians. This could lead to queuing on the footbridge which in turn has the potential to lead to queues on the stairs and platforms.

The two ends of the bridge, the entrance/ exit on the west side and the area on the east side leading to platforms 1 and 2, have been highlighted as areas of 'moderate potential capacity concern'. This is owing to the lack of step free access on and off the bridge. On the west side of the station this acts as a barrier to some station users as they will need to

access the eastern side of the station via the public highway. For those station users there is also an increase to their overall end-to-end journey time.

C.02.02 Stairs and platforms

The stairs to the footbridge from platforms 3 and 4 are shown to be an area of significant capacity concern in the 2043 scenario. This is caused by an increase in the assumed alighting loads from Portsmouth bound services which modelling suggests could put additional pressure on the stairs.

This would result in queuing on the platform, for passengers wishing to access the stairs, for a significant duration. Consequently, passengers may have to queue right up to the platform edge, which in turn would cause safety concerns and the subsequent service performance implications from delayed train dispatch.

The width of platforms 5 and 6 is also an area of significant capacity concern. The assumed increase in demand for fast London Waterloo bound services could result in congestion on platforms 5 and 6.

Again, this could lead to safety concerns as passengers fill the platform right up to the platform edge leading to safety concerns as passengers may congregate close to the platform edge. The alighting and boarding of trains may be slower as a result, which would impact on dwell times and train performance for those services affected.

C.02.03 Subway

The subway, as previously noted, is connected to the platforms via long, steep ramps. Owing to their gradient the ramps are not compliant with the code of practice set out within the Department for Transport's Design Standards for Accessible Railway Stations.

This means that the subway and ramps are classed under the category of moderate potential capacity concern. The subway and ramps therefore create an accessibility barrier for people with reduced mobility. Station staff are required to assist those passengers with reduced mobility up and down the ramps to ensure they can access the platforms safely.

In addition to the ramps there are blind corners on to the subway that increase the risk of accidents occurring.

C.02.04 Recommendations

The areas, shown in *Figure 11,* which are labelled as having minor/no potential capacity concerns are expected to continue to operate well in the face of increased demand.

After identifying the concerns detailed above, the following recommendations have been determined that would help to accommodate future demand at the station:

1. Improve accessibility through the provision of step-free access between the footbridge and the platforms; ideally through the provision of lifts
2. Replace the existing footbridge with a wider structure which includes lifts and additional stairs to the platforms. This would alleviate the issues identified on the platform 3 and 4 stairs as well as the west side entrance/ exit's lack of accessibility
3. Remove and fill in the subway and ramps to create more platform space and alleviate safety issues. This would help reduce the issues identified on platforms 5 and 6 by removing the void created by the subway ramp. The subway would need to be replaced by a fully accessible footbridge, as suggested in point number two

Further detail can be found in the original report located in Appendix C.

C.03 Timetable Analysis

The project commissioned some timetable analysis work to identify if any railway infrastructure would be required to accommodate the proposed future train service specification, as specified in *Table 2*. This workstream was designed to answer the following questions:

1. Is there enough platform capacity to operate the CP6 level of service?
2. Is there enough platform capacity to operate the CP7 level of service?
3. Is there enough platform capacity to operate the CP8 to CP10 level of service?
4. If the answer to any of the previous three questions is "no", then what infrastructure interventions may be required to enable that service level?
5. Is Platform 0 required as part of any identified infrastructure solution?

To answer these questions the analysis looked at a geographic scope that covered the area from the junctions to the north of Guildford, through Guildford Station to Shalford Junction to the south of Guildford, as shown in *Figure 12*, below.

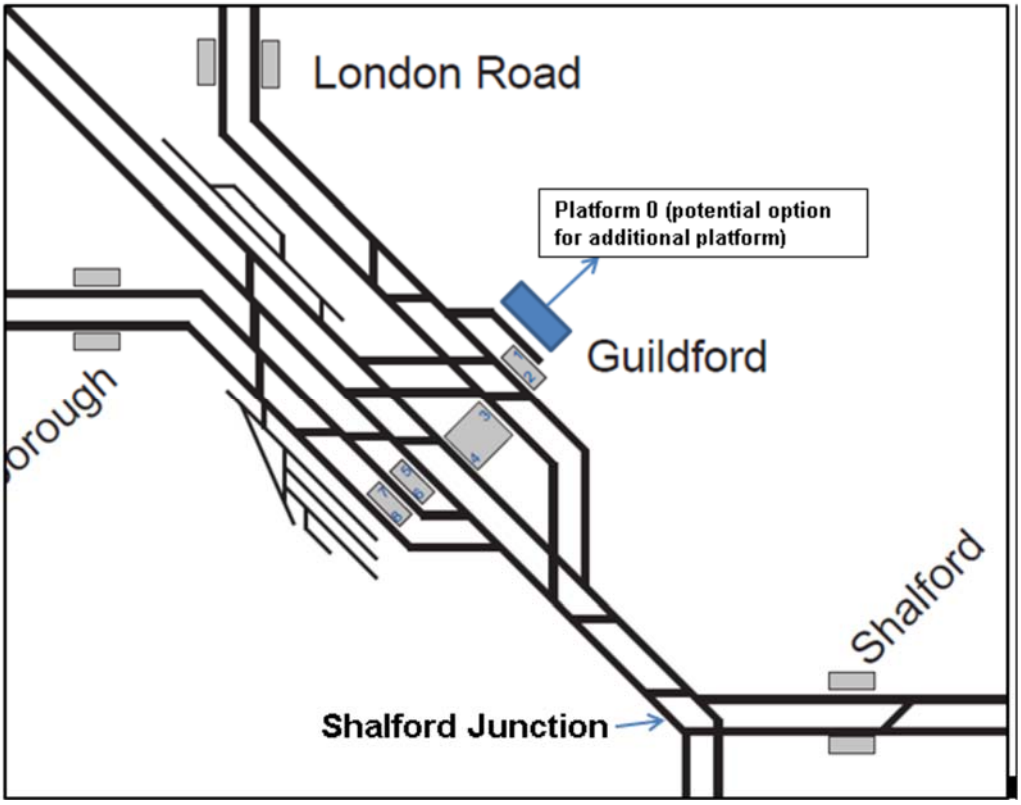


Figure 12: Geographic scope of timetable analysis

This workstream was carried out by the Capacity and Capability Planning team in the System Operator function of Network Rail.

C.03.01 Methodology

The analysis was carried out by setting up the timetable and infrastructure conditions in the Network Rail Train Planning System (TPS) using a copy of the December 2017 Working Timetable (WTT) as a base. The December 2017 WTT was chosen as the base because it provided a known baseline without the need to make assumptions on potential future changes to services, such as those proposed within the new SW franchise. TPS is the system that Network Rail uses to plan trains and assess capacity constraints.

To answer the above questions, each control period service level was then assessed in chronological order by systematically overlaying the next service level on to the previous one until conflicts were identified. These conflicts then signpost where a potential infrastructure intervention or change in train operation/ timetable would be required to enable the operation of the train service specification.

To identify the constraints and potential infrastructure interventions minimum Train Planning Rules (TPRs) were used. TPRs are the rules by which a timetable is built; rules include the amount of time after a train has left a platform that the platform can be reoccupied, and

similarly, there is a rule about the amount time after a train has crossed a junction that another train can cross it. These rules are important in maintaining the safe operation of the railway as well as enabling the resultant timetable to be operated robustly.

Minimum TPRs refer to the absolute limit that the rules can be stretched before there is an adverse impact on train performance as a result. However, operating a timetable solely on minimum TPRs does not provide sufficient space between trains or recovery opportunities should delay occur and therefore will impact on performance and timetable robustness.

C.03.02 Findings

After following the methodology, as detailed in section C.03.01, the capacity at Guildford Station was assessed and consideration was given to whether new infrastructure would be required to accommodate each control period service level change.

Control Period 6

By overlaying the additional Main Line service, released by the WACE scheme, and the additional North Downs Line service on to the December 2018 timetable the following observations were made:

- The current infrastructure at Guildford Station provides sufficient capacity to operate the additional Main Line service expected in CP6 and therefore no infrastructure is required
- For the additional London Waterloo bound (Up) Main Line service the most “natural” platform to be used would be Platform 5 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- For the additional Haslemere bound (Down) Main Line service the most “natural” platform to be used would be Platform 4 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- The current infrastructure at Guildford Station provides sufficient capacity to operate the additional North Downs Line service expected in CP6 and therefore no infrastructure is required
- For the additional Reading bound (Up) North Downs Line service the most “natural” platform to be used would be Platform 8 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)

- For the additional Reigate bound (Down) North Downs Line service the most “natural” platform to be used would be Platform 6 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- Neither the additional Main Line or the additional North Downs Line service can use Platform 2 and therefore a Platform 0 would have no benefit

Control Period 7

By overlaying the two additional Main Line services, released by the digital signalling scheme in the Wimbledon area, and the two new Southern Rail Link to Heathrow services on to the CP6 timetable overlay the following observations were made:

- The current infrastructure at Guildford Station provides sufficient capacity to operate the two additional Main Line service expected in CP7 and therefore no infrastructure is required
- For the two additional London Waterloo bound (Up) Main Line services the most “natural” platform to be used would be Platform 5 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- For the two additional Portsmouth bound (Down) Main Line services the most “natural” platform to be used would be Platform 4 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- The current infrastructure at Guildford Station provides sufficient capacity to operate the two new Southern Rail Link to Heathrow services expected in CP7 (or CP8) and therefore no infrastructure is required
- For the new Heathrow bound (Up) Southern Rail Link to Heathrow services, that start at Guildford, the most “natural” platform to be used would be Platform 5 as this provides the straightest route out of the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- For the new Guildford terminating (Down) Southern Rail Link to Heathrow services the most “natural” platform to be used would be Platform 4 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- The two new Guildford terminating/ starting Southern Rail Link to Heathrow services can use Platform 2; but there is sufficient capacity at Platform 4 and 5 for both the additional Main Line and new Heathrow services and therefore Platform 2 is not required

- Following on from the point above, as other platforms can be used (4 and 5) for the CP7 overlay there would be little benefit offered by having a Platform 0

Control Period 8 to Control Period 10

By overlaying the three additional Main Line services, released by the Crossrail 2 scheme, and another additional North Downs Line service on to the CP7 timetable overlay the following observations were made:

- The current infrastructure at Guildford Station provided sufficient capacity to operate 80% of the additional services (both Main Line and North Downs Line) expected in CP8 and beyond, but only by utilising minimum TPR values (therefore having a potential impact on performance and robustness)
- The remaining 20% of services that are not able to be accommodated on current infrastructure at Guildford Station would therefore require new infrastructure
- For the additional London Waterloo bound (Up) Main Line services the most “natural” platform to be used would be Platform 5 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- For the additional Portsmouth bound (Down) Main Line services the most “natural” platform to be used would be Platform 4 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- For the additional Reading bound (Up) North Downs Line service the most “natural” platform to be used would be Platform 8 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- For the additional Reigate bound (Down) North Downs Line service the most “natural” platform to be used would be Platform 6 as this provides the straightest route into the platform and would avoid the need to make crossing moves (crossing over other lines to access the platforms)
- Neither the additional Main Line or the additional North Downs Line service can use Platform 2 and therefore a Platform 0 would have no benefit

C.03.03 Conclusions and recommendations

As an overall conclusion from this analysis it can be stated that with all services, up to and including CP8/ CP10, combined there would be insufficient capacity at Guildford Station

when considering robustness of the timetable, performance risk and future service growth beyond the 2043 planning period.

As noted in section C.03.02, most of the additional/ new services naturally operate though the higher number platforms and therefore most of their impact will be on the west side of the station. Therefore, one of the key recommendations of the timetable analysis is that a new platform to address the capacity constraints at the station should be built on the west side and not the east side. For this reason, Platform 0 would not provide any useable benefit and is not recommended as part of this work.

An additional platform on the west side of the station, with associated track and crossovers, would enable trains to be spread out across more platforms and therefore allow more space in the timetable between the trains.

The benefit of this would be to minimise performance risk through the operation of a more robust timetable. In addition, a new platform would also future proof the station for growth beyond 2043.

The capacity benefit of delivering an additional platform would be further increased if combined with line speed improvements. Network Rail and GWR are working together to understand

C.04 Technical/ Engineering Options Study

Following the completion of the pedestrian capacity and timetable analysis workstreams the findings and recommendations were passed to the Network Rail Infrastructure Projects (IP) team to be developed into some high-level options for consideration. It is these options that will determine the red line boundary and therefore what land may be available for future development.

The completed analysis identified the following recommendations:

- A new, wider, fully accessible footbridge
- Additional platform capacity on the west side of the station

This part of the study will detail possible infrastructure options for these recommendations. It should be noted that these options are in a very early stage of development and therefore should not be considered as a final design. Further development work, including detailed surveys, would be required to finalise any such designs at the appropriate time.

C.04.01 Platform Options Overview

There are four main constraints, on the west side of the station, that have had an influence on the options that have been developed as part of this technical workstream; they are:

- The existing carriage and tamper sidings

- The Maintenance Delivery Unit
- The station car park
- The access road through the metallic span of Farnham Road Bridge

Figure 7 highlights these constraints on a plan of the station area.

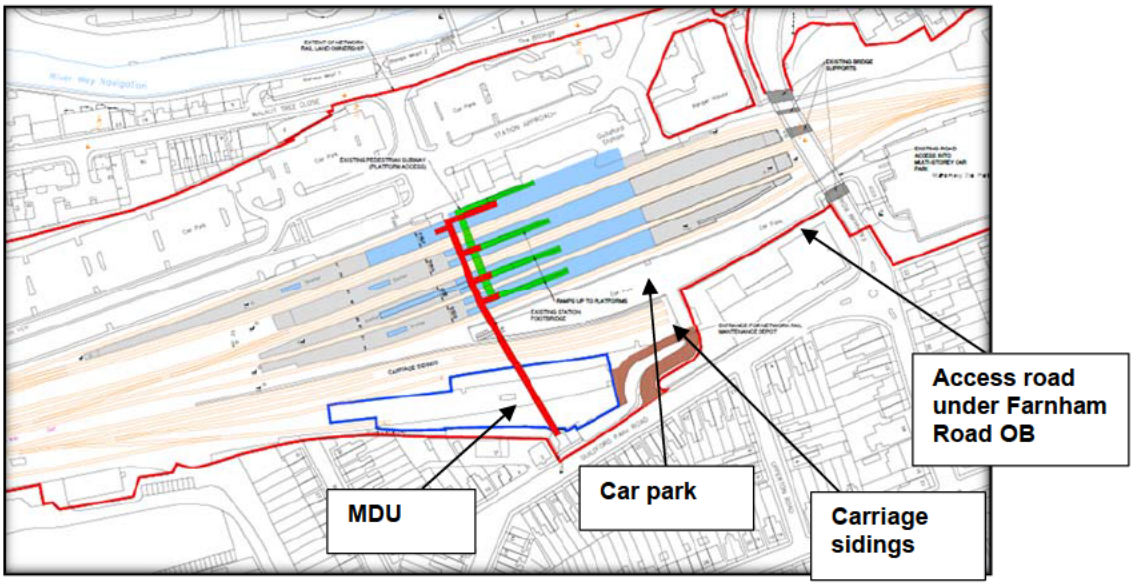


Figure 13: Constraints on the west side of station

Three concept options for the new platform have been developed for consideration. Validation of the proposed track alignments for the three concept options has been undertaken to understand the impact they could have on the land boundary.

The three options are:

1. A new single faced platform is to be provided to the western boundary of the station with associated track alignment

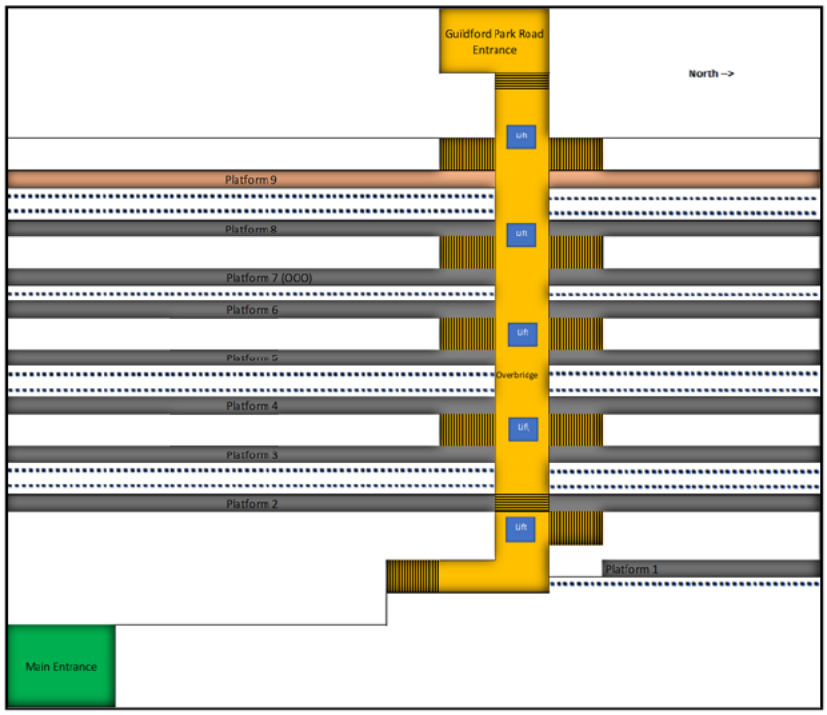


Figure 14: Option 1

2. The existing platform 7/8 is demolished and rebuilt as two single faced platforms to free up space and allow more efficient use of land

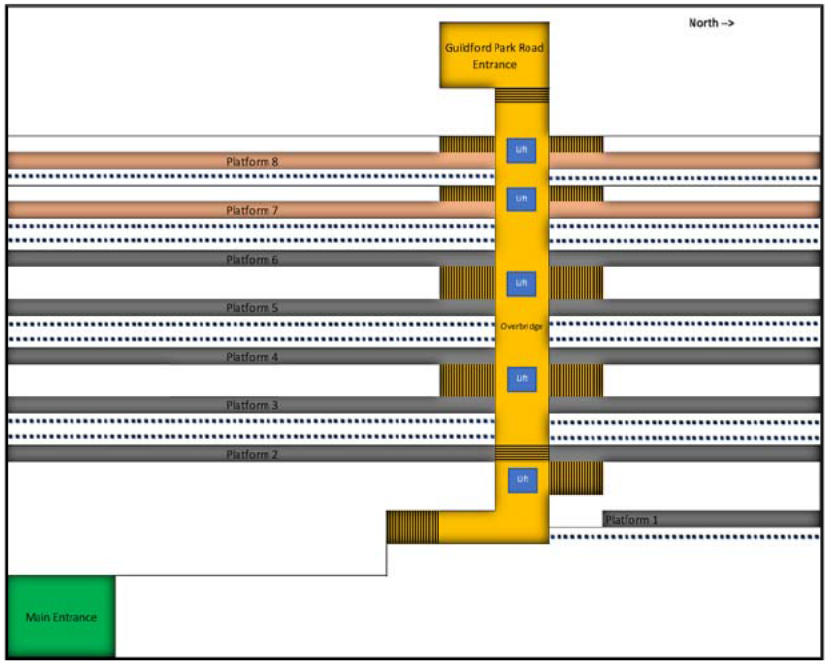


Figure 15: Option 2

3. Demolish and relocate platform 7/8 further west as an island platform with tracks serving both faces. This would allow an additional independent track to be provided for platform 7

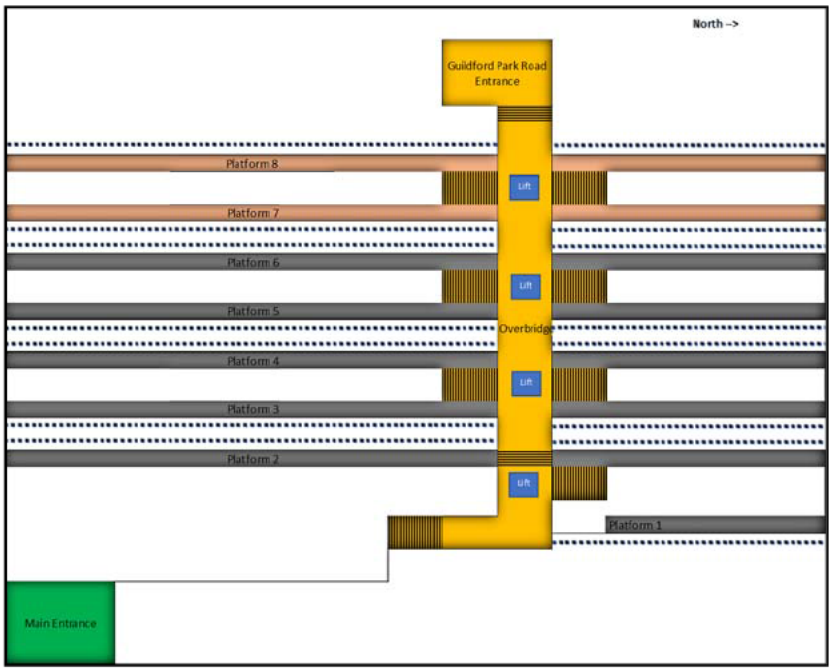


Figure 16: Option 3

Detailed diagrams of these options and their impact on the land boundary, and therefore their impact on land available for development, can be found in Appendix A.

All three options will require the carriage sidings to be relocated to make way for the additional or relocated platform infrastructure. It is rail industry policy that any material changes to the rail network, including any changes to the length or removal of the sidings, will be consulted with the wider industry and it is expected the lost capability would need to be accommodated or provided elsewhere.

The design approach taken for maintaining these sidings in the same vicinity has been to provide the existing lengths where reasonably practicable whilst maintaining vehicle access to the multi-storey car park on the north side of Farnham Road Bridge.

In the case of all options the existing passenger car park (not the Farnham Road Multi-Storey Car Park), located on the west side of the station, will need to be removed to accommodate the new infrastructure. These spaces are currently used by season ticket holders and have staircase access to the footbridge at peak times.

It is not, however, the land required for a new platform that has the biggest impact on the land that could be available for development. For a significant amount of land to be released for development it is the MDU that would need to be relocated.

Relocation of the MDU would be subject to the wider Wessex Route Accommodation Strategy, which is looking at potential options for consolidating accommodation across the Wessex Route, and full consultation with trade unions. Therefore, this study is not suggesting that relocation of the MDU is currently planned at this stage.

However, for the purposes of this study and for identifying the maximum potential land opportunity, all options have assumed that the MDU will be relocated. In case any operational land would still be required, even with the MDU relocated, a smaller land allocation for operational purposes has been made in all options.

C.04.02 Platform Options Analysis

	Summary	Pros and Cons
Option 1	A new single faced platform is to be provided to the western boundary of the station. Current platforms remain as existing.	This option provides constructability benefits and minimises impact on the railway during construction as the new platform can be built off the running railway. This option requires the most operational land take. It minimises impact on station users throughout its construction. A carefully developed staging strategy would allow the new platform to be seamlessly integrated with the reconstruction of the footbridge. Future design development might establish that providing a new double-faced platform is more robust in terms of future proofing, and this would further increase the operational land required.
Option 2	The existing platform 7/8 is demolished and rebuilt as two single faced platforms.	This allows more efficient use of the station footprint by providing two new single face platforms and might provide operational and staging benefits during construction. This option is a hybrid of option 1 and 3 and the differences in land take are insignificant. The existing Platforms 7/8 could potentially be re-used by minimising their width, but this will depend on the exact condition of the platforms and whether they can be altered. This assessment will need to be supported with evidence from future site surveys.
Option 3	Platform 7/8 is relocated further west as an island platform with tracks serving both faces. This would allow an additional independent track to be provided for Platform 7.	This option involves the provision of a new island platform. This would be disruptive as it would involve taking Platform 8 out of operation during construction. However, it provides the most efficient use of operational land and has more robust future proofing by bringing Platform 7 back into use.

Table 3: Pros and cons of options

C.04.03 Other Considerations

Accessibility

As previously noted, Guildford Station currently has several accessibility issues. The existing ramps do provide step free access to the platforms, however they are steeper than the standard mandated gradients (these can be found in the Department for Transport's Design Standards for Accessible Railway Stations, section P1) and are therefore not compliant.

There is no lift access at the station and the existing footbridge is also not compliant with the code of practice set out within the Department for Transport's Design Standards for Accessible Railway Stations as there is no step free access to the platforms, or indeed from the west side of the station.

Figures 8 and 9 show an aerial and an internal view of the current footbridge.

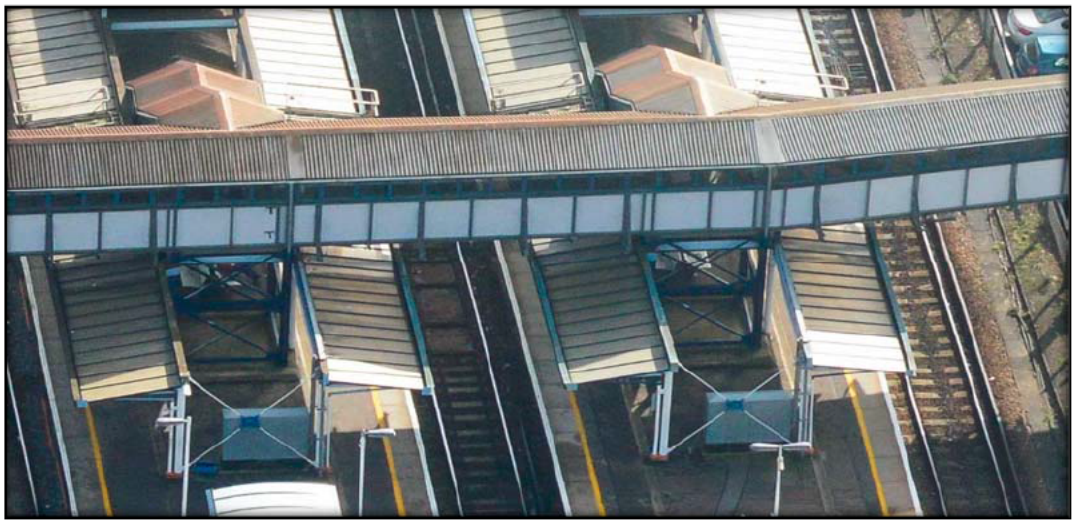


Figure 17: Existing station footbridge

A public right of way exists across the footbridge allowing access from west to east. It is assumed that this would need to be maintained in any potential footbridge options.

The pedestrian capacity analysis has highlighted that the footbridge has limited width, is of outdated construction and is unsuitable for cross platform passenger flows. It is not equipped to distinguish between station and non-station users and therefore causes issues regarding revenue protection.

Figure 18: Existing station footbridge

The existing ramps reduce the usable platform width that is available as they rise up out of the centre of the platform. This is an issue during busy periods resulting in congestion on platforms.

To improve accessibility at the station, and address the recommendation of the pedestrian capacity analysis, the provision of a new wider footbridge with stairs and lifts is proposed.

In this option, the existing subway and ramps would be removed and the void filled in to increase useable platform space.

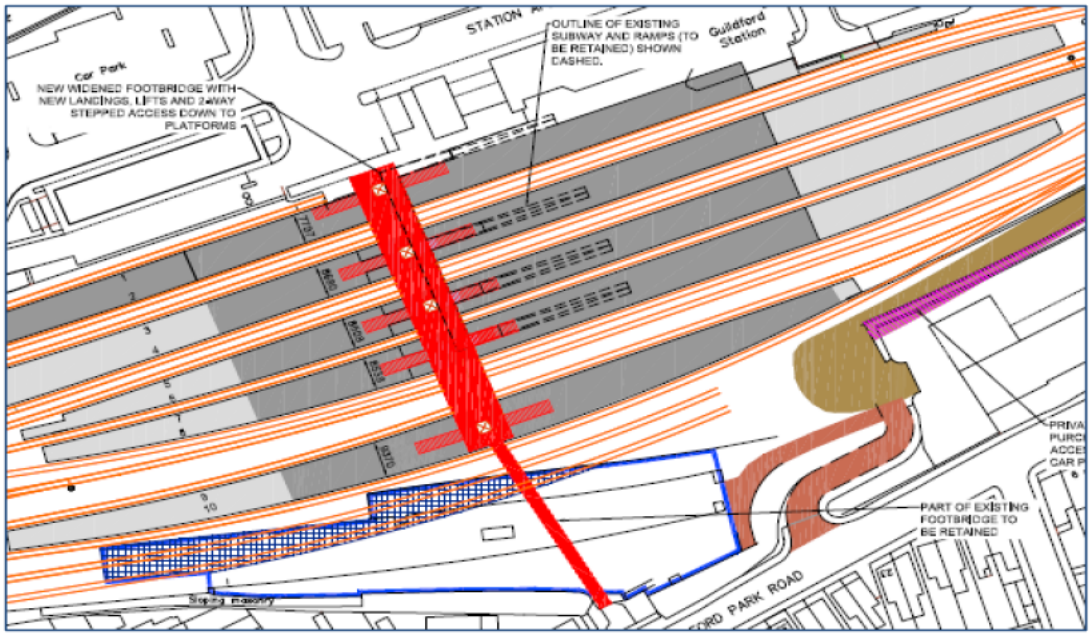


Figure 19: Possible design for a new accessible footbridge structure

The footbridge would be widened and could be demarcated into paid and unpaid sides to separate station users from non-station users and help with revenue protection.

There would be a standard lift per platform which could either be located centrally or provided at the opposite side to the stairs. Based on the pedestrian capacity analysis, there may be a requirement by 2043 to have two staircases off the footbridge, as shown in *Figure 10*. However, this will make it more challenging to separate users of the public right of way users from passengers.

How any future bridge alignment interacts with the Solum development, on the east side, and Guildford Borough Council's aspirations for the west side will need to be carefully considered.

Future Renewals at Guildford

The Wessex Route's plan for railway infrastructure asset renewals may provide the opportunity for synergies and efficiencies with the enhancements works (such as the new platform).

Internal discussions with Network Rail asset owners and a review of existing renewal plans have revealed the following:

- There are plans to renew the majority, but not all, of the Switches & Crossing (S&C) units at Guildford North Junction, spread over a period of 2 years within CP6
- There are pending plans to undertake refurbishment and strengthening works to Farnham Road Bridge within the last year of CP5 (2018-19) and first year of CP6 (2019-2020) to allow Network Rail to meet its liability for the structure. There are no plans to completely reconstruct the structure
- Guildford signalling re-control to the Basingstoke Route Operating Centre is not planned for at least the next 10 years; and therefore, is not currently available for development. The need to leave some signalling equipment on the site of the Guildford Signal Box means that once the signalling has been re-controlled the site may still not be available for development
- Any future signalling works associated with the additional platform are likely to require land for new signalling location cases (this has been considered in this study)
- Signal sighting (the position of signals to ensure train drivers can see them) is to be considered for above ground structures such as the proposed footbridge (this has been considered in this study)
- Potential, future overhead electrification should be considered when designing any over track structures

Long term planning discussions are already underway between the Wessex Route and System Operator for CP7 to enable a joined-up approach to renewal and enhancement decisions across the Wessex network. Where efficient and appropriate to do so renewal and enhancement works may be combined or re-planned to take advantage of these opportunities.

C.04.04 Technical recommendations

In order to provide more confidence in the identified land boundary, a full asset survey would need to be undertaken.

A full topographical survey would also need to be undertaken to allow a more accurate horizontal and vertical track design to be produced that validates the platform infrastructure proposals.

Any future design should review fire requirements and the provision of a secondary means of escape for the proposed platform. Firefighting access should also be considered as part of the future infrastructure design.

A full accessibility review of the station would be appropriate to verify and identify all accessibilities issues to ensure any future designs take account of them and where suitable seek to remedy them.

All these recommendations should be addressed as part of any future design work as and when the capacity and footbridge works are funded and progressed.

C.05 Complementary Measures

Network Rail was asked to consider, identify and present in this study other complementary measures, such as:

- Improvements to the customer experience at the station through improved facilities
- Planned developments in and around the station
- Integrating the station into other external interventions and initiatives, such as those being progressed by Guildford Borough Council

C.05.01 Solum Development

Solum is a joint venture partnership between Kier Group and Network Rail; which was established in July 2008 to attract private investment into the rail network and build much needed new homes close to transport hubs.

On the Wessex Route, Solum have already delivered scheme at Epsom Station and are currently building another development at Twickenham. In addition to this, in 2018 Solum received planning permission to deliver a development at Guildford Station.

The development at Guildford is a £150m scheme to deliver:

- a new station building
- 438 new homes
- office space
- an enhanced station plaza

Figure 20: The proposed Solum development on the Guildford Site

It is envisaged that the enhanced station plaza will provide an improved interchange between buses and taxis. Current proposals show dedicated space provided for kiss and ride facilities, taxi queuing, pick up and the inclusion of two bus stops within the interchange itself. A further four bus stops are to be provided on Walnut Tree Close.

Cycling facilities will also be improved as part of the development; which will provide, when combined with the transport proposals mentioned above, better integration with sustainable transport modes.

The plaza will also offer improved permeability from the station across Walnut Tree Close to the Walnut Tree Close Bridge. This will be designed to encourage station users to access the town centre without using Bridge Street. This is discussed in more detail later in this section of the document.

The scheme also includes the construction of a secure multi-storey car park retaining the same number of station parking spaces with improved, safer pedestrian access and reduced average walk time from car to platform.

The new station building has been designed so as to accommodate future passenger demand at Guildford. The ticket hall will be larger than the current arrangement and the gate line will be reconfigured to encourage permeability between the platforms and the station plaza. There will also be passive provision in place to increase the number of ticket gates in the future to further improve permeability and meet future passenger demand.

As part of the unilateral undertaking pursuant to Section 106 of the Town and Country Planning Act 1990 agreed between Solum, Network Rail and Guildford Borough Council, Solum are funding £2m worth of station improvements at Guildford which must be delivered prior to the date on which the new station building is first opened to the public. This will need to be agreed between all parties as the Solum development is taken forward.

C.05.02 Other Network Rail Station Interventions

An internal Network Rail Station Working Group is developing a roadmap of investment opportunities at the station. The majority of these are not currently funded. However, in the short term (next 2 years) it is expected that the following will be taken forward:

- a deep clean of the station
- refurbishment of the toilet facilities
- removal of the toilet turnstiles
- improvements to the flooring on the footbridge

These works may be supplemented by the Section 106 funds from the Solum development, which as previously noted are not yet agreed.

Network Rail also aspire to improvements to the west side entrance/ exit. These aspirations are shared by Guildford Borough Council.

As part of the platform capacity works identified in this study there is also the requirement for a new, wider, accessible footbridge.

C.05.03 Local Authority Proposals and aspirations

At a joint workshop on 4th June 2018, Guildford Borough Council detailed their aspirations for complementary connectivity measures at the station.

Town Centre Transport Package

Guildford Borough Council presented their plans for a £9.26m package of works to improve transport facilities in the town centre.

Specific measures include:

- Walnut Tree Close – Guildford Borough Council proposes to reduce traffic using Walnut Tree Close, located to the east of Guildford Station, to prevent rat running and reduce the number of vehicles joining the congested A322 gyratory from Walnut Tree Close.

  Guildford Borough Council initially propose to operate Walnut Tree Close as a one-way road before a full closure is implemented with the road becoming a non-through road. This is expected to be implemented in Summer 2019. See location below in *Figure 12*

- Walnut Tree Bridge – Guildford Borough Council have proposals in place to replace the current footbridge bridge, which spans the River Wey, located just to the east of Guildford Station.

  They plan to implement a wider bridge which allows simultaneous pedestrian and cycle use. The Solum improvements to the public realm are designed in such a way that pedestrians from the station are directed to this bridge. This will be supplemented by wayfinding. This will improve links between the railway station and town centre. Full planning permission has been granted for the new bridge has been granted and the bridge is expected to open in 2020. See location below in *Figure 12*

- Other improvements – forming part of the Town Centre Transport Package, but not directly impacting the station, include improvements to the exit of the Millbrook car park, improvements to Bridge Street/Onslow Road pedestrian crossings and public realm works

Figure 21: Improvements planned by Guildford Borough Council

Other initiatives

There are several other initiatives in the Guildford area that may also impact on Guildford Station and its use.

- There are plans to demolish existing garage buildings on Guildford Park Road and redevelop the site to provide approximately 160 residential apartments and houses. This will include new infrastructure, parking, access, landscaping, cycle storage and associated facilities. There will also be private and communal amenity space together with a five storey 541 space multi-storey public car park and 825 sqm. of flexible commercial floorspace on the ground floor of the multi-storey car park
- The 'Sustainable Movement Corridor' aims to improve connectivity between housing and commercial developments and the town centre. The package will improve access by all transport modes, particularly public transport, into the town centre and to the west of Guildford
- Guildford West Station is a new station proposal promoted by Guildford Borough Council. If delivered, the station will be located between Guildford and Wanborough on the North Downs Line.

The station will provide improved access to the Royal Surrey County Hospital (RSCH), the Surrey Research Park, University of Surrey's Manor Park campus, the Surrey Sports Park and the existing Park Barn residential area.

- Guildford East Station is a new station proposal promoted by Martin Grant Homes with support from Surrey County Council and Guildford Borough Council. If delivered, the station will be located between London Road (Guildford) and Clandon on the Guildford New Line.
- Guildford Borough Council plans to introduce a community bike share scheme in 2019/20. Capital funding has already been secured to deliver this.

C.06 Conclusions and Recommendations

Section C of this document forms the main part of the Guildford Land and Rail Study and has been produced through the delivery of four main workstreams:

1. Analysis of pedestrian flows and capacity at Guildford Station
2. Timetable analysis to identify what level of train service the station can handle and at what point additional infrastructure is required to accommodate the deliver the desired service level
3. A technical study that took the output of the pedestrian and timetable studies and developed options for providing the required capacity and operational outputs at Guildford
4. Identification of complementary measures that would improve the customer experience at the station

These workstreams seek to answer the following five questions:

1. What is the future platform requirement to accommodate demand in the planning period to 2043?
2. What is the operational land requirement in the Guildford area; including sites such as the Maintenance Delivery Unit (MDU) and the signal box location etc.?
3. What are the renewals plans for all assets groups in the Guildford area; with emphasis on structures and track infrastructure?
4. What Network Rail land is not required for operational purposes and could therefore be released for development?
5. How can the passenger experience be improved to provide a station fit for the future that meets the needs of passengers and can accommodate future demand?

C.06.01 What is the future platform requirement to accommodate demand in the planning period to 2043?

The timetable analysis, carried out as part of this study, produced a model based on the current rail infrastructure and train service. This was then overlaid with the expected train service changes in CP6, CP7 and CP8+ to identify at what point the infrastructure could not accommodate the changes within acceptable performance tolerances.

The analysis provided the following conclusions:

- Platform 0 is not required to provide platform capacity improvements at Guildford Station
- The CP6 train service specification, of +1tph Main Line service and +1tph North Downs Line service, can be accommodated on current infrastructure
- The CP7 trains service specification, of +2tph Main Line services and 2tph Southern Rail Link to Heathrow services, can be accommodated on current infrastructure
- The CP8+ train service specification, of +3tph Main Line services and +1tph North Downs Line service, cannot be accommodated on current infrastructure without a detrimental effect on service performance
- An additional platform is required on the west side of the station to operate the CP8+ level of service

Therefore, the future platform requirement to accommodate demand to at least 2043 is one additional platform on the west side of the station.

C.06.02 What is the operational land requirement in the Guildford area; including sites such as the Maintenance Delivery Unit (MDU) and the signal box location etc.?

The technical report analysis sought to answer this question through discussion with various Network Rail departments and came to the following conclusions:

- The MDU is a key strategic operational site
- The Wessex Accommodation Strategy is investigating ways of consolidating and improving the Wessex Route's portfolio of staff accommodation
- So far, the Wessex Accommodation Strategy has not yet reached a conclusion on how MDUs might be consolidated across the Wessex Route
- The signal box is where the Guildford area (whose limits are Effingham Jn, Worplesdon, Blackwater and north of Farncombe) is controlled from
- The signal box is not currently planned to be re-controlled to the Basingstoke Railway Operating Centre (ROC) in the next 10 years

- When the signal box is re-controlled to the ROC there will still be signal interlocking equipment on site at Guildford

The MDU and the signal box are the two main operational sites (other than the station itself) that needed careful consideration as part of this study.

C.06.03 What are the renewals plans for all assets groups in the Guildford area; with emphasis on structures and track infrastructure?

This study has concentrated on the renewals plans for Control Period 6 as these are the ones that have been defined as part of the Wessex Route Strategic Business Plan submission to DfT/ ORR.

- There are plans to renew the majority, but not all, of the Switches & Crossing (S&C) units at Guildford North Junction, spread over a period of 2 years within CP6
- There are pending plans to undertake refurbishment and strengthening works to Farnham Road Bridge within the last year of CP5 (2018-19) and first year of CP6 (2019-2020) to allow Network Rail to meet its liability for the structure. There are no plans to completely reconstruct the structure
- As noted in C.06.02 the re-control and renewal of the Guildford signalling area is not planned within the next 10 years

Where efficient and appropriate to do so, Network Rail will always try to combine renewal and enhancement programmes to provide the best value for money solution.

C.06.04 What Network Rail land is not required for operational purposes and could therefore be released for development?

This question answers one of the main aim of this study by identifying the red line boundary around the station that encapsulates the land needed for operational and future growth use. These packages are:

	Availability for development
East side of the station	Unavailable for development as it is already part of the Solum development. The site will be developed by Solum over CP6.
Signal box	Unavailable for development as it is not planned to be re-controlled to the Basingstoke ROC in at least the next 10 years. Following re-control, the site will still contain signal interlocking equipment.

Season ticket car park and access road	The car park between the current Platform 8 and the sidings on the west side of the station is unavailable for development. This area is required for the additional platform recommended by this study to meet future passenger growth and demand. The access road is required to maintain access to the Farnham Road Car park, further to the south.
Maintenance Delivery Unit	This is the key piece of land that may become available for future development. There is a current workstream assessing the Wessex Route's accommodation needs. Part of that workstream is looking at the viability of a "super MDU" by which several MDUs are combined. In this study we have assumed that combining Guildford MDU with other MDUs will happen and that it will be on a site other than Guildford, as this is the only site that may come available for development. In the drawings shown in Appendix A of this document we have assumed a residual area required for operational purposes at an alternative site near the station. However, it is important to note this is subject to further consideration as part of the accommodation strategy and will require trade union consultation. Therefore, this study is not confirmation of the MDU moving. It is expected that this strategy will continue to be developed through early CP6.

Table 4: Availability of land

C.06.05 How can the passenger experience be improved to provide a station fit for the future that meets the needs of passengers and can accommodate future demand?

There are several complementary measures that have been identified that will see improvements to passenger experience:

- Solum development (CP6)
- a deep clean of the station (short-term)
- refurbishment of the toilet facilities (short-term)
- removal of the toilet turnstiles (short-term)
- improvements to the flooring on the footbridge (short-term)

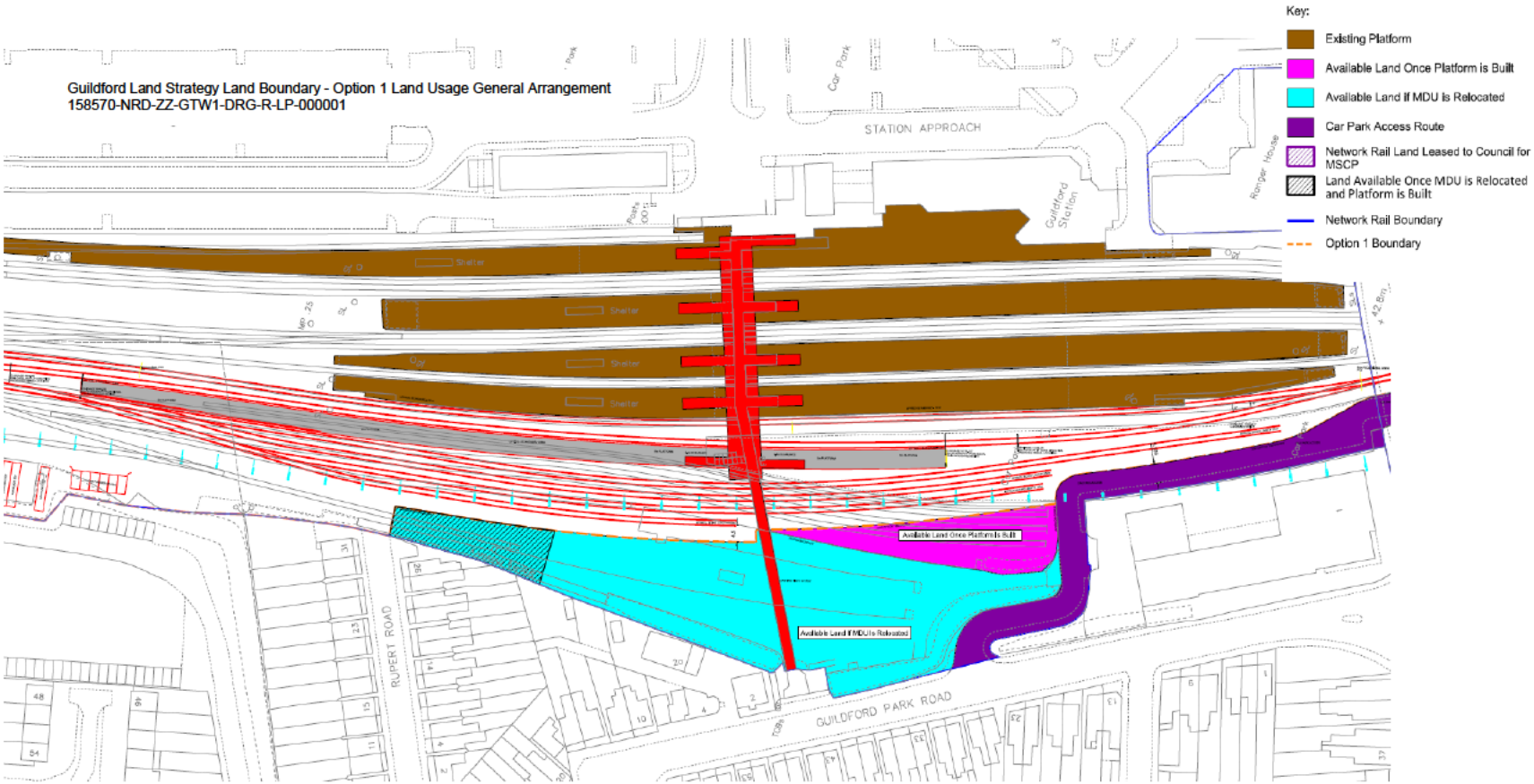
- Improvements to west side entrance/ exit (medium-term)
- Walnut Tree Close closure to through traffic
- Walnut Tree Bridge widening
- New footbridge associated with platform capacity
- Other Town Centre Transport Package initiatives
- Guildford Park Road residential development
- Sustainable Movement Corridor
- Guildford West new station
- Guildford East new station

Network Rail and Guildford Borough Council will continue to work in collaboration to realise the benefits of schemes that provide an improved passenger experience.

Part D: **Appendix A – Drawings**

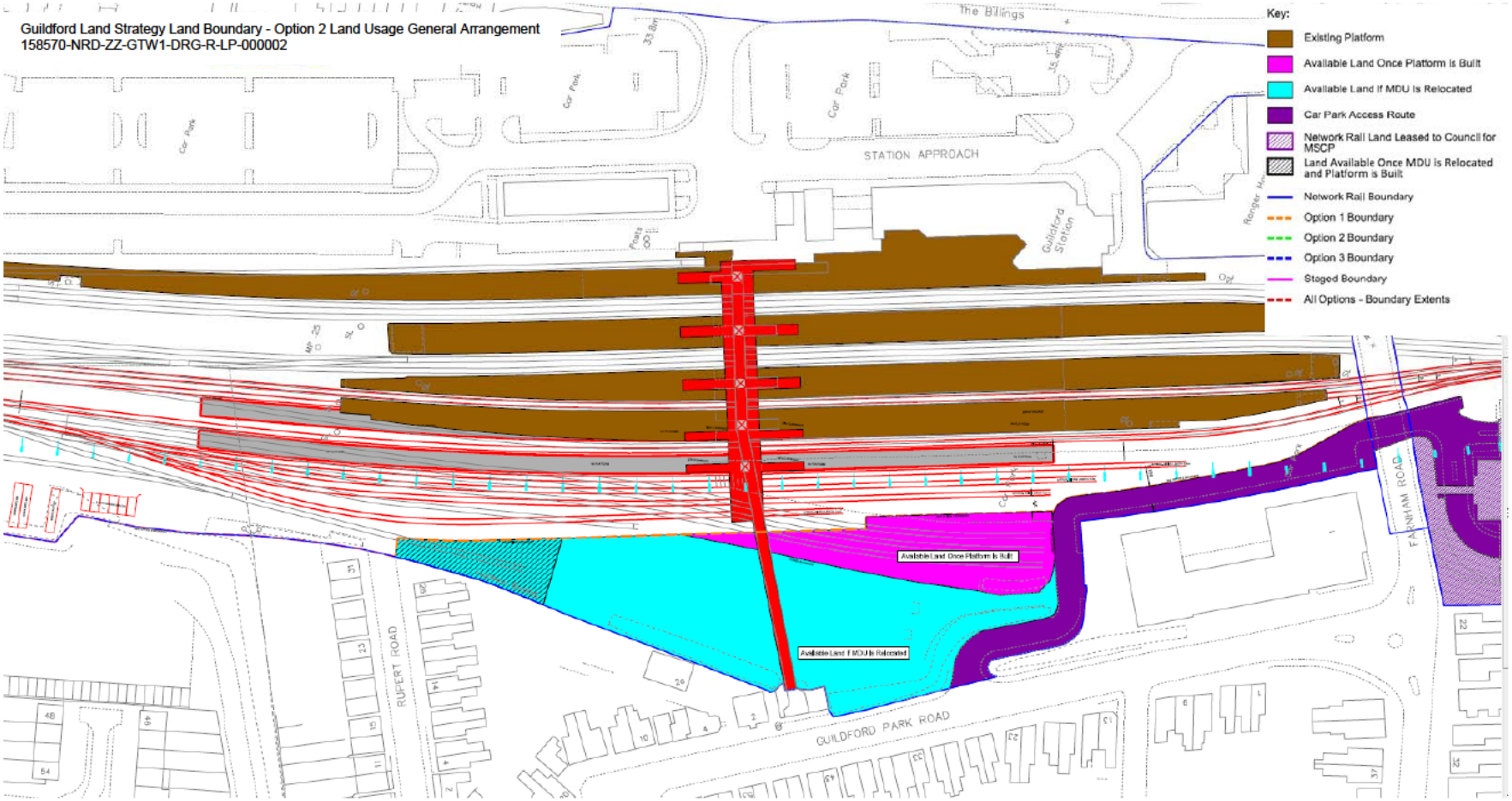
D.01 Option 1 Land Usage General Arrangement Drawing Ref: 158570-NRD-ZZ-GTW1-DRG-R-LP-000001

New, single faced platform to be provided to the western boundary of the station with associated track alignment. Current platforms remain.



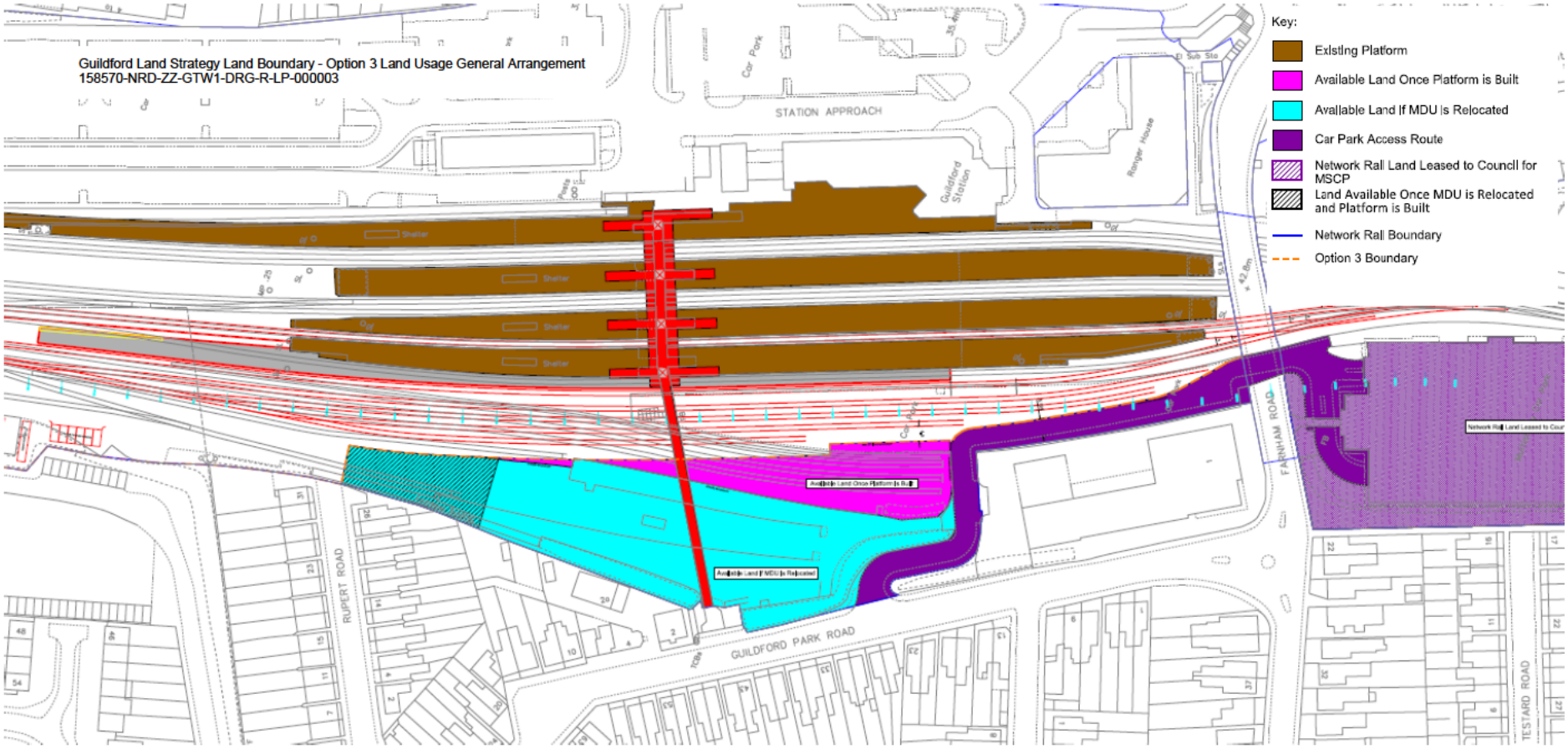
D.02 Option 2 Land Usage General Arrangement Drawing Ref: 158570-NRD-ZZ-GTW1-DRG-R-LP-000002

Demolish existing platform 7/8 and rebuild as two single faced platforms.



D.03 Option 3 Land Usage General Arrangement Drawing Ref: 158570-NRD-ZZ-GTW1-DRG-R-LP-000003

Demolish platform 7/8 and relocate further west as an island platform with tracks serving both faces.



Part E: **Appendix B – Timetable Capacity Study**

Guildford Land Strategy

Timetable Analysis Report

Capability & Capacity Analysis – System Operator

29/05/2018

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Document Owner:

Toby Saint-Clair

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Ref.	**Document Name**	**Document Ref. No.**	**Date**	**Rev**
001	Remit	Final	12/03/2018	-

Abbreviations	
Acronym	**Meaning**
CP	Control Period
SRT	Sectional Running Time
TPH	Trains Per Hour
TPR	Timetable Planning Rules
TPS	Timetable Planning System
WTT	Working Timetable

Contents

Part A: **Executive Summary**

The main aim of the analysis was to assess if infrastructure enhancements are required at Guildford Station to deliver aspirations for additional services through control periods CP6, CP7 and CP8. The outputs and recommendations of the analysis will inform the Guildford Land Strategy programme, if land at Guildford Station is to be retained for the future.

The analysis took a phased approach, assessing the control periods in chronological order by implementing the additional services for each period to the base timetable (December 2018 Working Timetable).

The key conclusion is that additional infrastructure will be required by CP8 in the form of a new platform plus the associated track and crossovers.

Additional service specifications described for CP6 and CP7 could be accommodated within the Dec18 timetable, with the current infrastructure at Guildford Station and Shalford Junction. Therefore there will not be any need for new infrastructure during CP6 and CP7. The majority of the aspired services for CP8 could only be accommodated on minimum Timetable Planning Rules (TPR) values, which causes insufficient capacity at Guildford Station in terms of robustness of the timetable, operational performance risks and future service growth.

From a land perspective the key conclusion is that land will need to be retained west of Guildford Station (see Figure 3). Further investigation and analysis would be needed to firstly establish potential infrastructure and station layout options. This would then inform the quantity of land to be retained, which may vary between different options.

The analysis found that due to their routings, all additional services would mainly use the platforms on the west side of the station. Therefore by CP8 additional infrastructure in the form a new platform, track and crossovers serving the west side of the station would be required to provide more platform capacity.

Additional recommendations which may provide further benefits are:

- **Line Speed Improvements:** Increasing line speeds, with the aim of reducing the current TPR values (e.g. junction margins/headways). Lower TPR values result in greater capacity or providing robustness through enabling more space between trains.
- **Timetable Revision:** Planning the future timetables to make the most efficient use of the platform and station capacity at Guildford, by planning trains into platforms where crossing and conflicting moves are minimised.

Part B: **Introduction**

B.01 Background

Guildford Borough Council (GBC) has engaged with the System Operator function of Network Rail to discuss the future development of Guildford Station both in terms of operational needs, including growth through future demand, and the opportunity for residential and commercial development in the station area.

B.02 Aims and Objectives

The aim of the project was to determine what the future platform requirement would be to accommodate demand to 2043.

There are three potential step changes in service level associated with the provision of sufficient Main Line capacity in the planning period to 2043; these are:

- The implementation of Woking Grade Separation in CP6 – it is expected that this will enable, in the short-term, the operation of two additional Main Line services in the high peak (arrivals at London Waterloo between 08:00 and 08:59). It was assumed that one of these services originates from Haslemere and calls at Guildford
- The implementation of Digital Railway in CP7 – it is expected that this will deliver the capability to operate an additional four Main Line services in the high peak. It was assumed that one of these services originates at Havant and calls at Guildford, and another starts at Guildford.
- The implementation of Crossrail 2 in CP8 – it is expected that this will unlock seven additional Main Line paths into London Waterloo. It was assumed for the purposes of this study that three of these services operate beyond Guildford and that they all call at Guildford.

Main Suburban services, those terminating or originating at Guildford that utilise the Guildford New Line via Cobham or the line via Leatherhead, were assumed to be as per the SWR franchise bid timetable.

In terms of the North Downs Line there are two potential step changes in service level associated with the provision of sufficient capacity in the planning period to 2043:

- An increase to 3tph all day in each direction; 1tph stopping service between Reading and Redhill (and in the reverse) and 2tph semi-fast services between Reading and Gatwick Airport (and in the reverse) – this was assumed in the CP6 timeframe

- An increase to 4tph all day in each direction; as per 3tph but with the addition of another semi-fast service (this is a local stakeholder aspiration) – this was assumed in the CP8 timeframe.

In addition, provisions are made for the ability to operate 2tph terminating services from the proposed Heathrow Southern Access proposals, in the CP7 timescale

The changes are summarised in the table below:

CP6	**Woking Grade Separation:** 2 additional Main Line services in the high peak. Assumed that 1 of these originates from Haslemere. **North Downs Line:** An increase of 1 additional train per hour in each direction.
CP7	**Digital Railway:** 4x additional mainline services in the high peak. 1 of these starts at Havant and another starts at Guildford. **Heathrow Southern Access:** 2x additional terminating services in CP7
CP8	**Crossrail 2:** Expected to unlock 7x Main Line paths to Waterloo. Assumed that 3 of these operate on the Portsmouth Direct Line and will call at Guildford (the remaining 4tph were assumed to operate via Basingstoke and are therefore not part of this work). It was assumed that these services will not terminate at Guildford. **North Downs Line:** An increase of 1 additional semi-fast train per hour in each direction.

Table 1. Control Period Specifications – additional to Dec18.

A previous study looked at the potential of an additional terminating platform on the east side of the station next to the current platform 1. This is referred to as platform 0 and was considered as an option during the analysis.

The objective of this timetable analysis was to determine if the service levels described above could be accommodated in each of the Control Periods with current infrastructure.
If the service levels could not be accommodated, the constraints would be identified and suitable recommendations made; mainly in terms of what additional platforms would be required.

There were no known exclusions. All known schemes up to and including CP8 are considered as to the impact on service levels at Guildford.

B.03 Geographic Scope and Station Layout

The main geographic scope for the analysis is Guildford Station as shown below.

Outside of Guildford, the analysis considered Shalford Junction which due to its proximity to Guildford is relevant from a timetable compliance perspective.

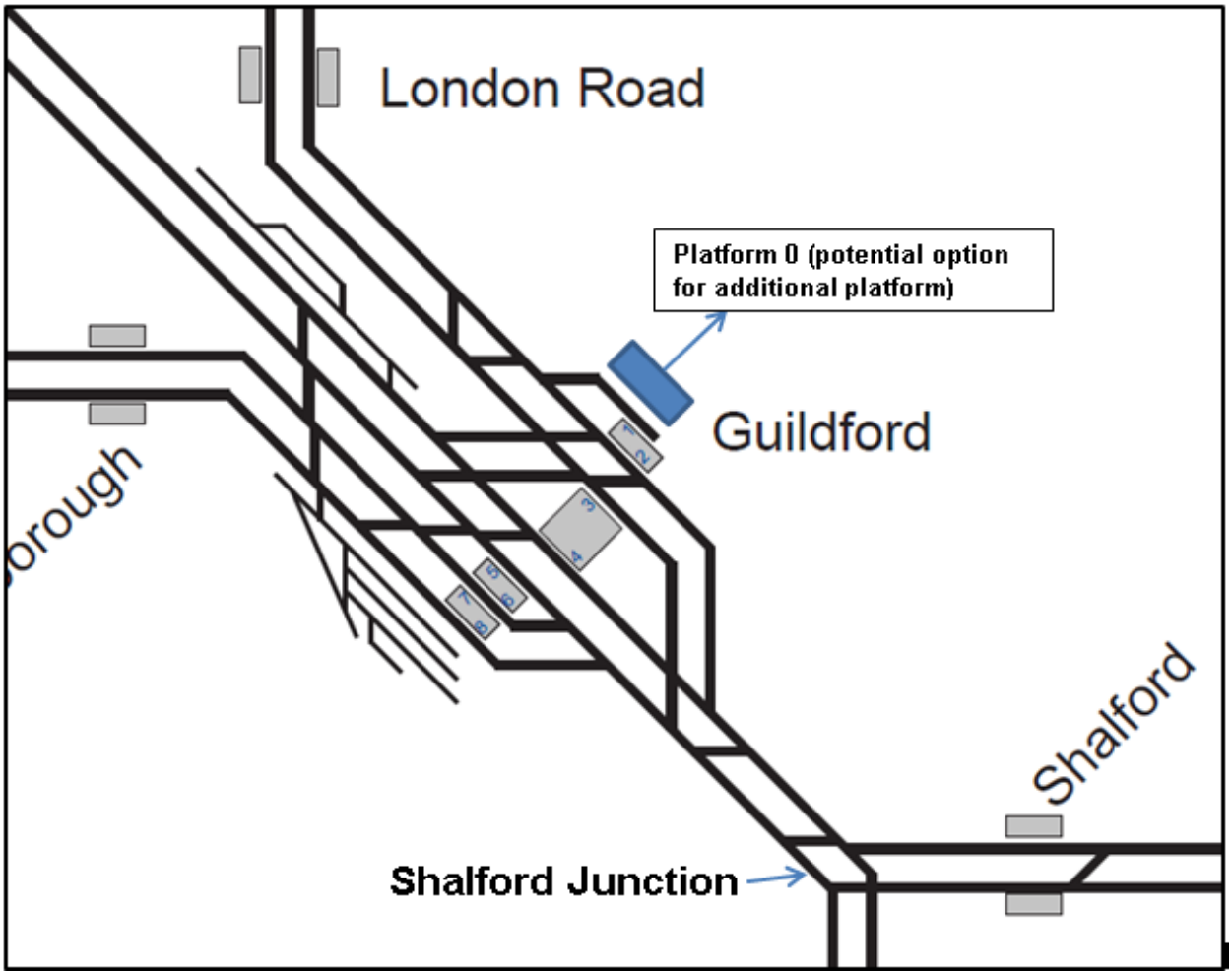


Figure 1: Guildford station and immediate area layout.

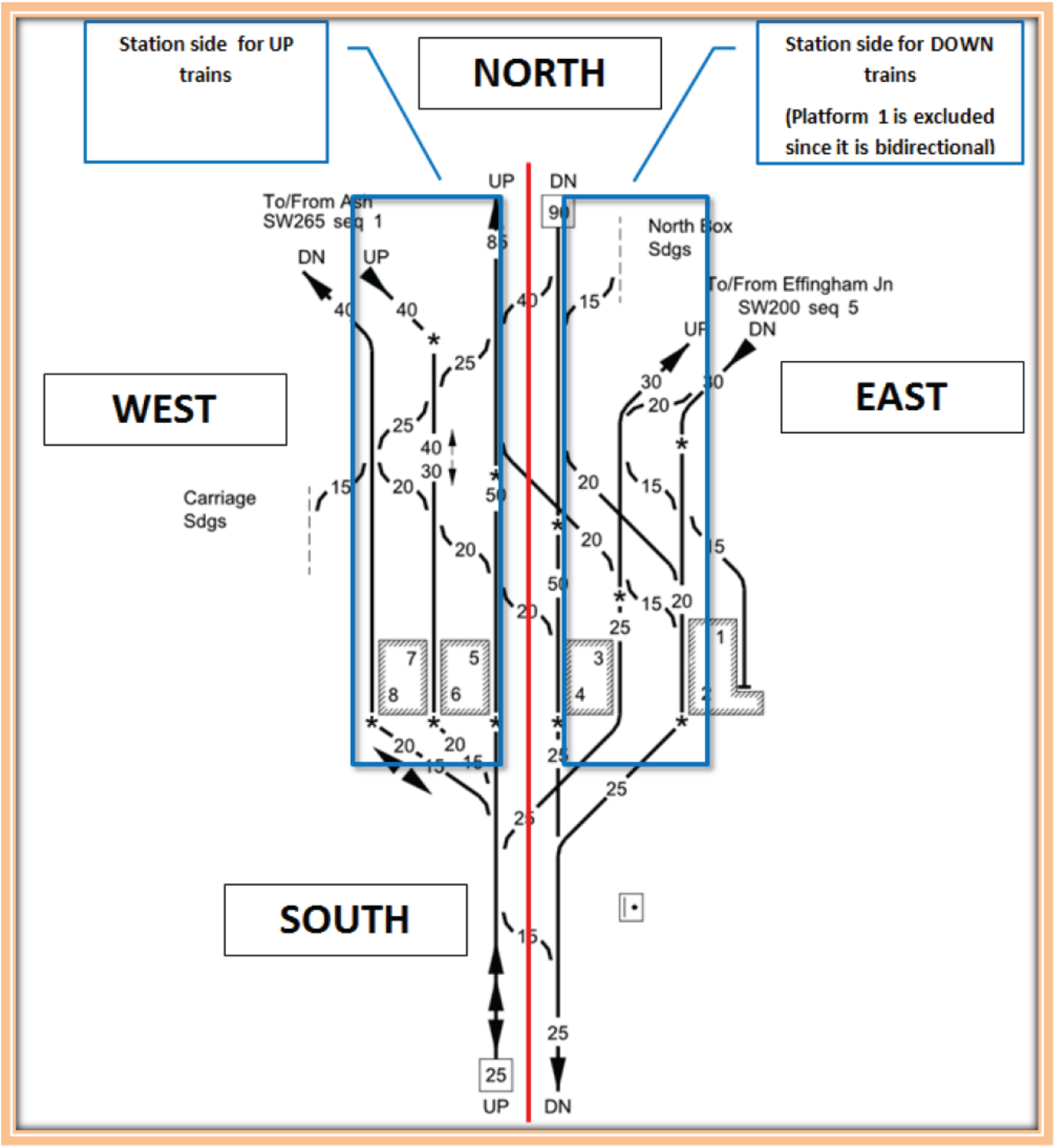


Figure 2: Sides of Guildford Station

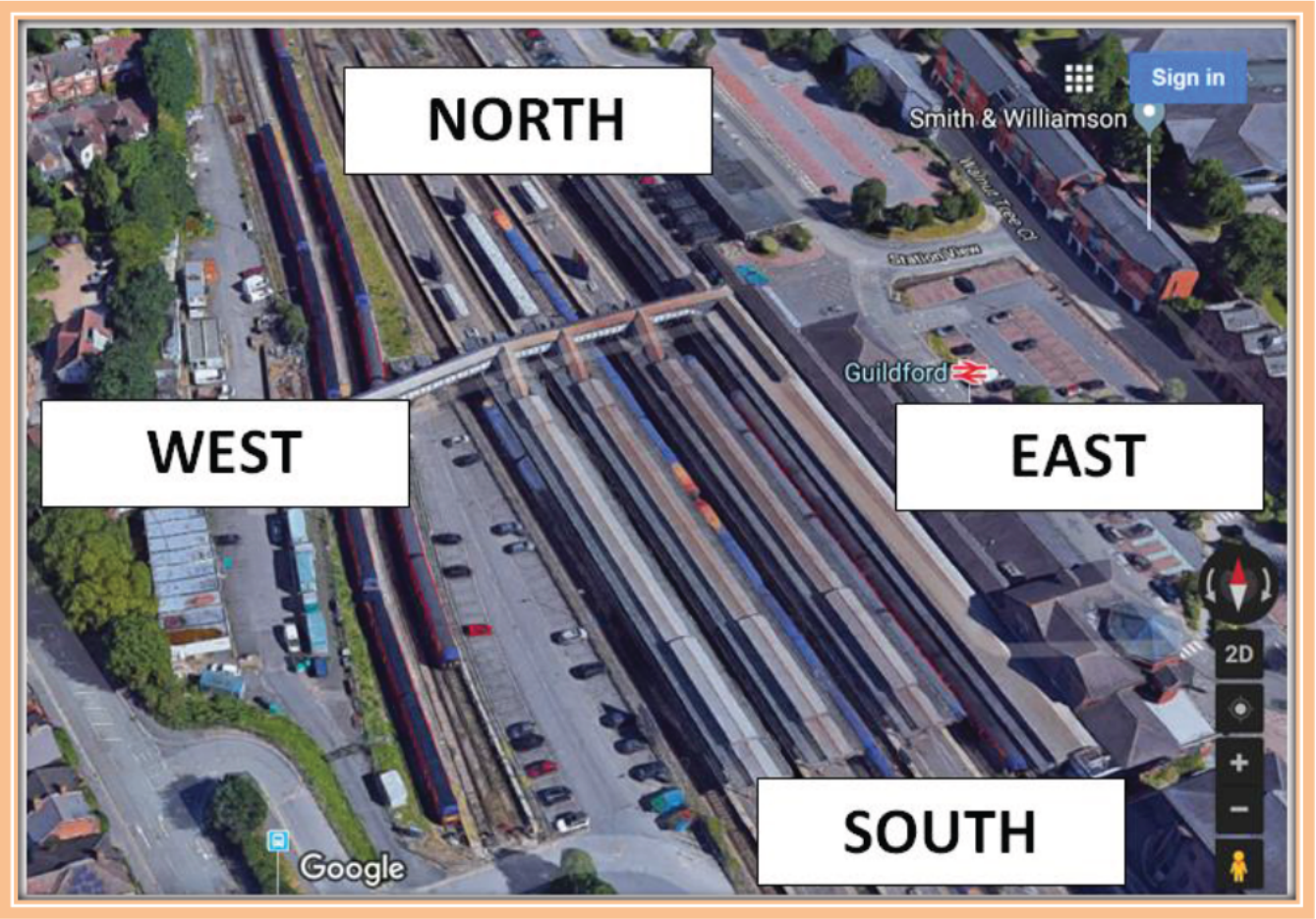


Figure 3 : Guildford Satellite View

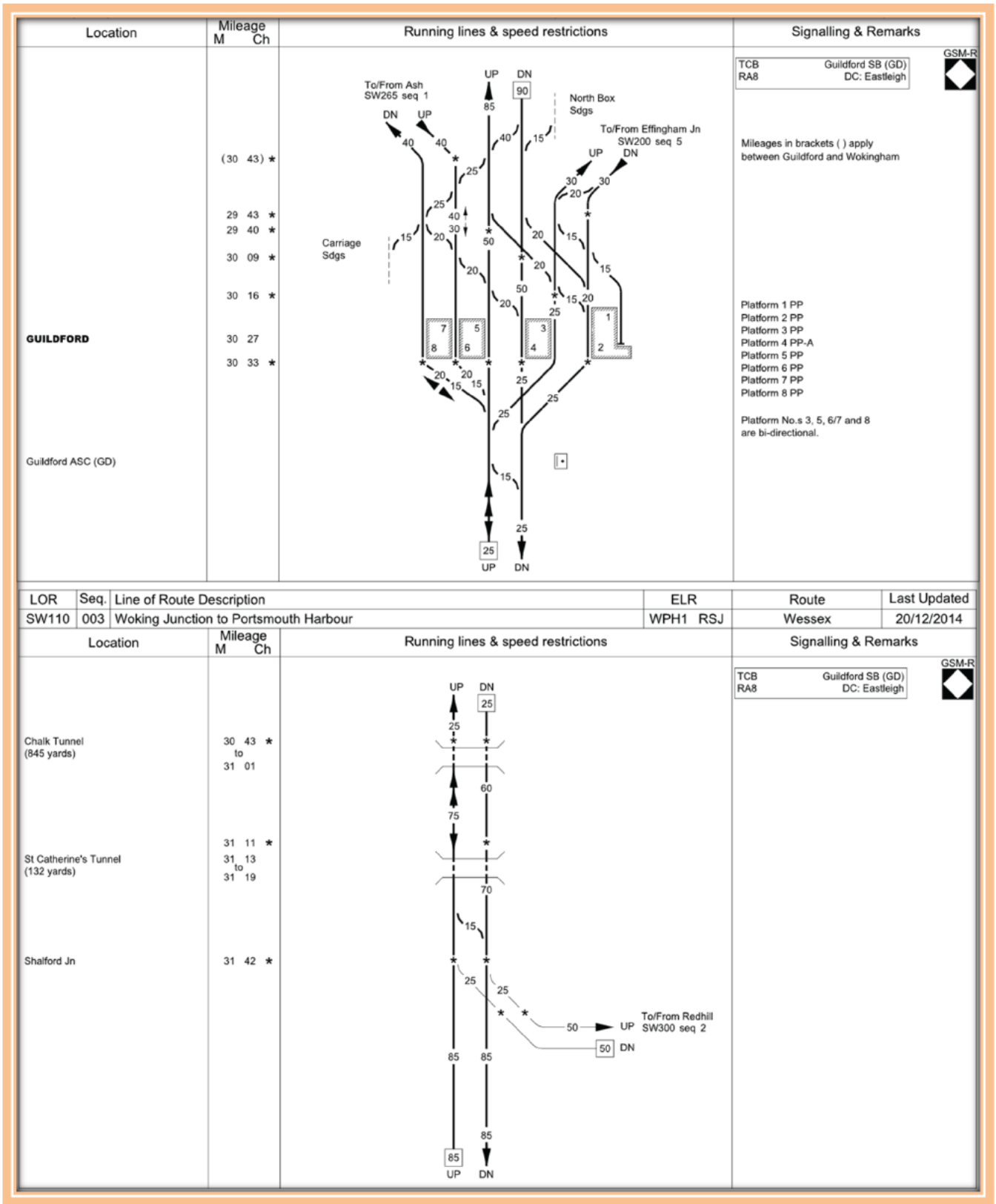


Figure 4: **Guildford Station and Shalford Junction Line Speed**

Part C: **Methodology**

The project was setup in TPS using a copy of the Dec18 WTT as a base.

An individual assessment was then made for each of the Control Periods, in chronological order (CP6 > CP7 > CP8). For each assessment, trains were created in the TPS project to meet the additional train specifications as per Table 1 of this report. This was also done in chronological order.

CP6: This was assessed first. The additional trains for the Woking Grade Separation were added to the base for the 3 hour peak period; 0700 to 0959 and North Downs Line were increased 1 additional train per hour in each direction.

The Guildford Station area was analysed to determine if there is capacity to operate the train specifications, firstly with the current infrastructure and if not, what is required to accommodate the trains. As a specific infrastructure enhancement, the proposed Platform 0 was considered as a possibility. The assessment also looked at other possible enhancements and made suitable recommendations.

For the timetable and specifications to be deemed viable, train paths were required to be compliant to the TPRs.

CP7: Once CP6 was assessed, the additional trains for CP7 (Digital Railway and Heathrow Southern Access derived trains) were added to the timetable, on top of the base plus CP6 trains. This was assessed in an identical fashion as to CP6.

For the aspiration of the 2 additional terminating Heathrow Southern Access trains, there is the option within the assumptions for these to be added in CP7 or CP8. These were firstly assessed as part of CP7 with the findings recorded and then assessed as part of CP8.

CP8: The additional trains for the CP8 specifications (Crossrail 2, Heathrow Southern Access and North Downs Line) were added to the project, which contained the base timetable plus both the CP6 and CP7 trains. With all trains up to and including CP8 included the timetable was assessed.

Part D: **Assumptions**

D.01 Timetable Scope

The analysis focused on the weekday morning peak hour, which was considered to be from 0800 to 0859 at London Waterloo. The average current journey time between Guildford and London Waterloo is approximately 45 minutes. Taking this into account the high peak hour at Guildford was considered to be from 0720 to 0819.

Additionally, to assess a repeated pattern, the analysis considered the full 3 hour morning peak period from 0700 to 0959.

D.02 Timetable Planning Rules

The following TPRs applied to this analysis; 2018 version 4.2.

D.02.01 Exceptions to the TPR

There were no exceptions to the TPR. Existing rules were used for analysis of additional platforms

D.03 Timing Load Assumptions

The timing loads for existing service routes were as per the source timetable (e.g. Wessex Mainline, North Downs Line).

For future schemes, the timing loads were assumed for those specific schemes:

- Heathrow Southern Access: Class 455 (Since there are no SRTs for Class 345 the best comparable rolling stock was used)
- Crossrail 2: Class 450 (Since there are no SRTs for Class 707 the best comparable rolling stock was used)

D.04 Source Timetable

The source timetable for the analysis was the December 2018 timetable. Modification to these services was undertaken where required to assess the feasibility of the future aspirations.

D.04.01 Additional Services

Additional services were added where required to meet the CP6, CP7 and CP8 specifications.

D.05 Infrastructure

The infrastructure for the timetable analysis was as per the current layout. The analysis considered what new infrastructure; particularly additional platforms may be required to accommodate the service aspirations.

Platform 0 was considered as a specific option if required, as an additional terminating platform.

D.06 Known Exclusions

There were no known exclusions. All known schemes up to and including CP8 were considered as to the impact on service levels at Guildford.

Part E: Findings

E.01 CP6 Findings

After implementing the additional services to the Dec18 timetable, the capacity at Guildford Station and Shalford Junction was assessed. The assessment considered if new infrastructure will be required to accommodate the CP6 service specifications.

The capacity was measured against the minimum TPR values. The analysis found that the minimum TPR values were exceeded, with the current infrastructure at Guildford Station providing sufficient capacity for the CP6 service specifications.

A quality planned timetable makes the most efficient use of the platforms and which platforms are used based on the route of a train. Often this is to utilise the use of parallel moves* between trains at different platforms, to minimise crossing moves and to minimise the inclusion of junction margins to the timetable, which can reduce the capacity potential.

* **Parallel move:** Two trains passing each other on adjacent tracks, at a defined location at the same time.

For the CP6 additional trains, the usable platforms are as follows:

- **Woking Grade Separation:**

Direction	Platform Number	Comments
UP	5	Most natural platform for straight route, avoiding crossing moves
UP	4	Can be used, but requires two crossing moves and are considered to be on the side of Guildford for DOWN trains. (Please refer to Figure 2)
UP	3	Can be used, but requires three crossing moves and are considered to be on the side of Guildford for DOWN trains. (Please refer to Figure 2)
UP	6	Can be used, but requires one crossing move
UP	8	Can be used, but requires two crossing moves
DOWN	4	Most natural platform for straight route, avoiding crossing moves
DOWN	3	Can be used, but requires one crossing moves
DOWN	2	Can be used, but requires two crossing moves

DOWN	5	Can be used, but requires two crossing moves and are considered to be on the side of Guildford for UP trains. (Please refer to Figure 2)
DOWN	6	Can be used, but requires three crossing moves and are considered to be on the side of Guildford for UP trains. (Please refer to Figure 2)
DOWN	8	Can be used, but requires four crossing moves and are considered to be on the side of Guildford for UP trains. (Please refer to Figure 2)

Table 2: Usable Platforms for Main Line services

There was sufficient capacity at Platform 5 to accommodate the services in the Dec18 timetable after the implementation of the additional Woking Grade Separation trains.

As it can be seen in the above table, due to their routings the additional Woking Grade Separation services do not use platforms 1 and 2.

- **North Downs Line:**

Direction	Platform Number	Comments
UP	8	Most natural platform for straight route, avoiding crossing moves
UP	6	Can be used, but requires one crossing move
UP	5	Can be used, but requires two crossing moves
UP	4	Can be used, but requires four crossing moves
DOWN	6	Most natural platform for straight route, avoiding crossing moves
DOWN	5	Can be used, but requires one crossing move
DOWN	8	Can be used, but requires one crossing move
DOWN	4	Can be used, but requires two crossing moves

Table 3: Usable Platforms for North Downs Line services

As it can be seen in the above table, due to their routings the additional North Down Line services cannot use platforms 1, 2 and 3.

There was sufficient capacity at Platform 8 (for UP trains) and Platform 6 (for DOWN trains) to accommodate the services in the relevant directions of travel in Dec18 timetable after the implementation of the additional North Downs Line trains.

E.02 CP7 Findings

After implementing the additional services, the capacity at Guildford Station and Shalford Junction was assessed. The assessment considered if new infrastructure will be required to accommodate the CP7 service specifications which were implemented to the base timetable (Dec18) plus CP6 additional services.

The capacity was measured against the minimum TPRs. The analysis found that the minimum TPR values were exceeded, with the current infrastructure at Guildford Station providing sufficient capacity for the CP7 service specifications.

Digital Railway released services use the same route as Woking Grade Separation Services. Therefore the usable platforms are as per Table 2.

Heathrow Southern Access Services also use the same route as Woking Grade Separation Services. Therefore the usable platforms are as per Table 2. However since these services are in the DOWN direction they can use platform 2 but can not use platform 1.

There was sufficient capacity at Platform 5 (for UP trains) and Platform 4 (for DOWN trains) to accommodate the services in the Dec18 timetable after the implementation of the additional CP7 trains.

E.03 CP8 Findings

After implementing the additional services, the capacity at Guildford Station and Shalford Junction was assessed. The assessment considered if new infrastructure will be required to accommodate the CP8 service specifications which were implemented to the base timetable (Dec18) plus CP6 and CP7 additional services.

Cross Rail 2 released services use the same route as per the Woking Grade Separation Services. Therefore the usable platforms are as per Table 2.

The capacity was measured against the minimum TPRs. There were 5 additional services per hour for CP8. The analysis found that 80% of the additional CP8 services (4tph) could be accommodated within the timetable, but only on minimum TPRs. The remaining 20% (1tph) could not be accommodated whilst meeting the minimum TPRs.

A timetable planned to only minimum TPR values is not deemed to be robust and presents a risk to performance; as it does not provide sufficient space between trains or recovery opportunities should delays occur.

Overall, with all services up to and including CP8 combined, there would be insufficient capacity at Guildford Station when considering robustness of the timetable, performance risks and train service growth beyond CP8.

Part F: Conclusions & Recommendations

F.01 Conclusions

As per CP6 and CP7 findings, the additional service specifications described for the relevant control periods could be accommodated within the Dec18 timetable, with the current infrastructure at Guildford Station and Shalford Junction. Therefore there would not be any need for new infrastructure such as new platforms or tracks during CP6 and CP7.

However as per the CP8 findings, 20% of the additional services (1tph out of 5tph) could not be accommodated. The remaining additional services (4tph) could only be accommodated on minimum TPR values, which would cause insufficient capacity at Guildford Station in terms of robustness of the timetable, operational performance risks and future service growth. Therefore new infrastructure would be needed for CP8.

As stated in the findings section, due to their routings, the majority of the additional services for CP6, CP7 and CP8 do not use platforms 1, 2 and 3 which are on the east side of the station. This means that the additional services would mainly have an impact on the west side of the station. The option of a terminating Platform 0 on the east side of the station which was considered in a previous study will not be required.

Guildford has 8 numbered platforms, only 7 are usable. This is due to platforms 6 and 7 sharing a single track road through the station. Subsequently only one of these platforms can be used at any one time, which can be considered as another factor that could increase the pressure on the west side of the station.

As a result, by CP8 land on the west side of the station would be needed for additional infrastructure in the form of an additional platform and the associated additional track, to be able to accommodate the aspired service levels. Further investigation and analysis would be needed to firstly establish potential infrastructure and station layout options. This would then inform the quantity of land to be retained, which may vary between different options.

F.02 Recommendations

As stated in the conclusions section new infrastructure would be needed to accommodate the required service specifications by CP8.

- **Additional Platform**

The service specifications described for CP6, CP7 and CP8 would mainly have an impact on the west side of the station due to their natural platform usages on the basis of their routings.

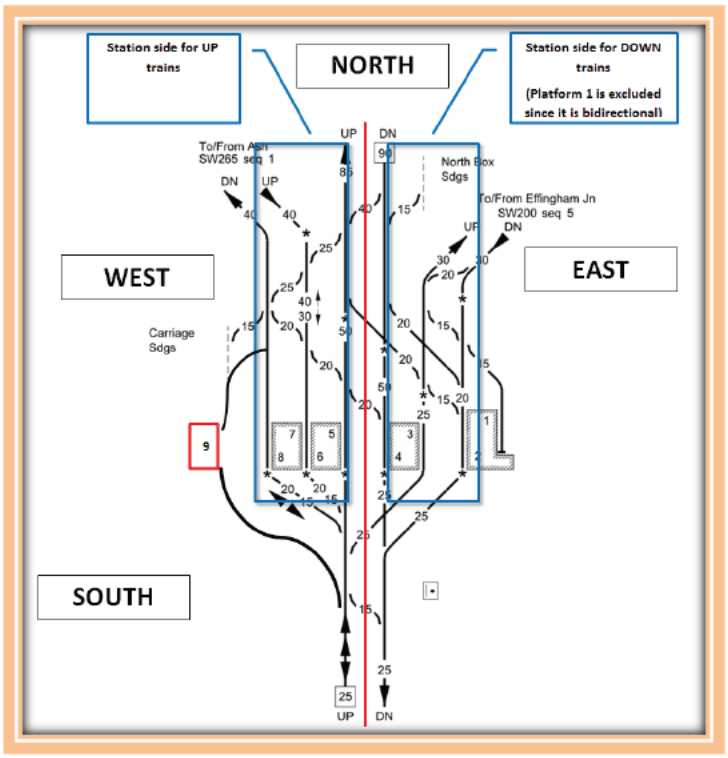
Therefore, additional infrastructure in the form a new platform, track and crossovers serving the west side of the station would be required to provide more platform capacity. This would enable spreading the trains out and ensuring more space in the timetable between trains. The benefits would be to minimise the performance risks by enabling a more robust timetable. Additional infrastructure may also enhance the station for the future train service growth beyond CP8.

An additional platform ideally needs to be accessible to/from the main Up and Down lines through Guildford (known as the Portsmouth lines, to/from Woking and Portsmouth via Guildford), and to/from the North Downs lines (to/from Ash).

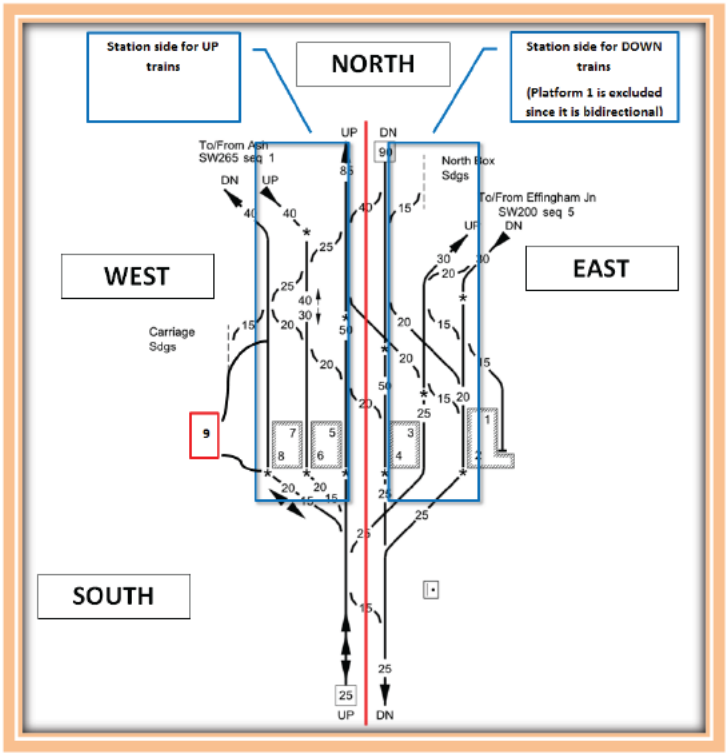
Also, a through platform is assumed to be more advantageous in providing flexibility in both directions. However a terminal platform may provide sufficient capacity for turnback services, whilst allowing through services to be spread across the other existing platforms.

On the following pages are basic drawings showing the potential station layout options for the additional infrastructure to be built by CP8. Further investigation and studies would be needed to detail these and alternative options by specialist Network Rail engineering/ infrastructure teams.

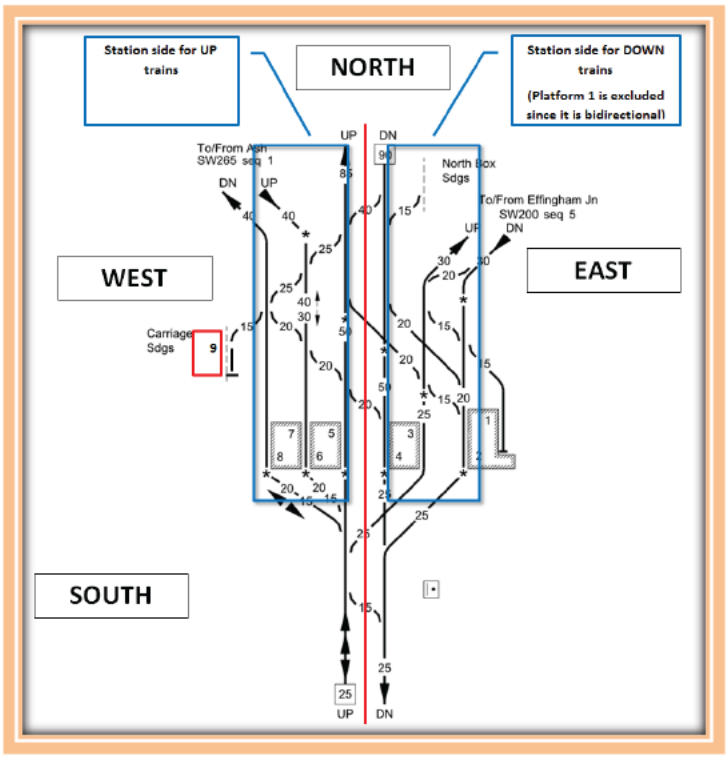
Option 1: An additional through platform independently connecting to the Up main line and North Downs line (Down direction). Existing crossovers north and south of the station allow access to the Down main line and North Downs line (Up direction).



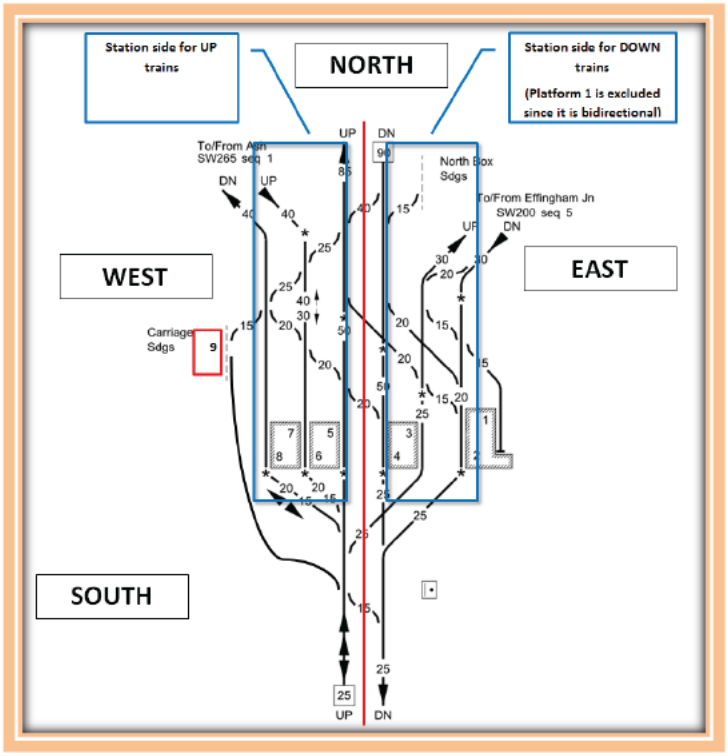
Option 2: An additional through platform similar to Option 1; alternatively connecting south of the station using the existing crossovers between the Up main line and platform 8.



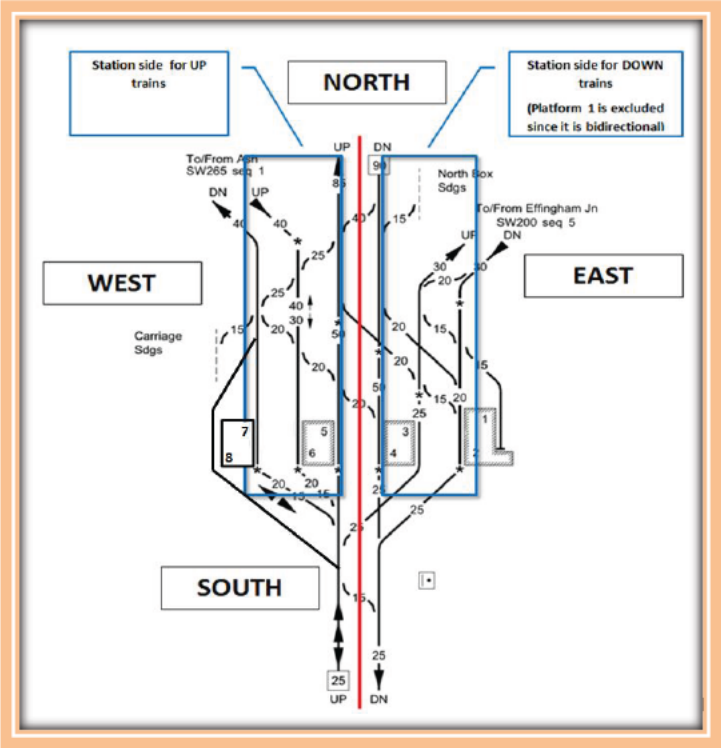
Option 3: An additional terminal platform to be built in the carriage sidings. Offering turnback capability for services travelling to/from the north, both on the main and North Downs lines.



Option 4: An additional through platform to be built in the carriage sidings, offering the same connections as per Option 1.



Option 5: An additional through platform realised by moving 7/8 island to the west and adding a new track, making platform 7 usable.



The capacity benefit of delivering an additional platform would be further increased if combined with Line Speed Improvements.

- **Line Speed Improvements**

Figure 4 shows the distance and the line speeds between Guildford Station and Shalford Junction. Shalford Junction is only 1m and 9ch (or 1.79km) away from Guildford Station. Due to its proximity, Shalford Junction has a natural impact on the timing of trains and subsequently the capacity usage at Guildford Station.

Hypothetically, if the line speeds were increased at Guildford Station and Shalford Junction, lower TPR values (e.g. junction margins/headways) than the current TPR values may be possible. In simple timetable planning terms, lower TPR values result in greater capacity or providing robustness through enabling more space between trains.

This positive impact would be a lower the risk of potential poor performance through delays at Guildford Station and the wider Wessex network.

Further analysis would be recommended to review the existing TPR values in consideration of an increase of the line speeds at Guildford Station and Shalford Junction.

- **Timetable Revision**

A quality planned timetable makes the most efficient use of the platforms depending on which platforms are used on the basis of the routings of the trains. Often this is to minimise crossing moves and the inclusion of junction margins to the timetable, which can reduce the capacity potential.

Please refer to Table 2 and Table 3 which states the usable platforms and the most efficient platforms for the additional service specifications described in CP6, CP7 and CP8.
It is recommended that in the future timetables are planned to make the most efficient use of the platform and station capacity at Guildford, by planning trains into platforms where crossing and conflicting moves are minimised.

Part F: **Appendix C – Pedestrian Capacity Study**

Guildford Land Strategy

Station Capacity Analysis

28/06/2018

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1.3	04/06/2018	Final – Updated following workshop with Guildford Borough Council
1.4	28/06/2018	Final – Updated with intervention requirements

Contents

Part A: **Executive Summary**

A.01 Study Purpose

This study assesses Guildford station to identify station capacity requirement to accommodate forecast 2043 passenger demand. A “high-level” approach has been taken to assess the station with a view to informing more detailed analysis in the future.

A.02 Conclusions

A summary of the station capacity issues identified at the station in provided in Figure 1and the significant and moderate potential capacity concerns are explained in more detail in – Significant Potential Capacity ConcernsTable 1 and Table 2.

Figure 1– Station Capacity Summary with 2043 Forecast Demand

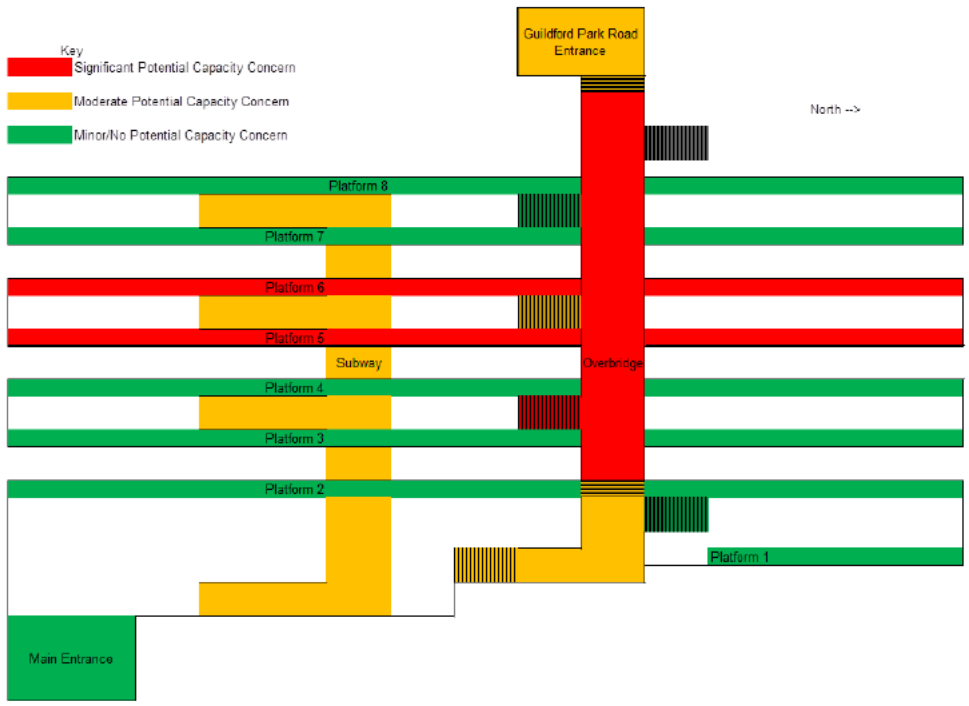


Table 1 – Significant Potential Capacity Concerns

Location	Concern
Footbridge	An increase in the number of passengers and non-rail users using the footbridge to interchange and access the station entrances could lead to increased congestion. The lack of stair run-offs disrupt cross-flows currently, this will only worsen with increased demand. Any queuing that occurs on the footbridge has the potential to lead to queues occuring on stairs.

P3&4 Stair	An increase in the alighting loads from Portsmouth bound services has the potential to lead to queuing occuring on the platform for a significant duration. This could lead to passengers queuing to the platform edge, creating a safety risk and potentially affecting train performance.
P5&6 Width	An increase in boarding demand for fast Waterloo bound services could see the central sections of this platform island become congested forcing passengers to walk along the platform edge and increasing the risk to their safety. Additionally this could slow the alighting and boarding process, increasing train dwell times.

Table 2 – Moderate Potential Capacity Concerns

Location	Concern
Footbridge	The lack of step-free access from the western station entrance creates a barrier to a number of station users, both passengers and non-rail users, who are unable to access the station from this side. This leads to longer journey times as a longer route via the public highway is needed to reach the more accessible eastern side of the station.
Subway	While the subway provides a step-free route to the platform, its non-compliant design creates another barrier to PRMs. An increase in demand increases the risk of accidents occurring due to the blind corners or passenger rushing.

Table 3 – Recommendations

#	***Recommendations***
1	Provide step-free access, ideally lifts, across the station, this will improve accessibility to for all station users by removing the current barriers.
2	As a means of providing step-free access, the existing footbridge could be replaced with a wider structure that includes lifts and additional stairs. This would have potential to alleviate the significant capacity concerns.
3	Removing the subway would enable more platform space to be provided as the ramp voids would be covered over. This would also remove the non-compliances and safety issues connected to the subway.

Part B: **Overview**

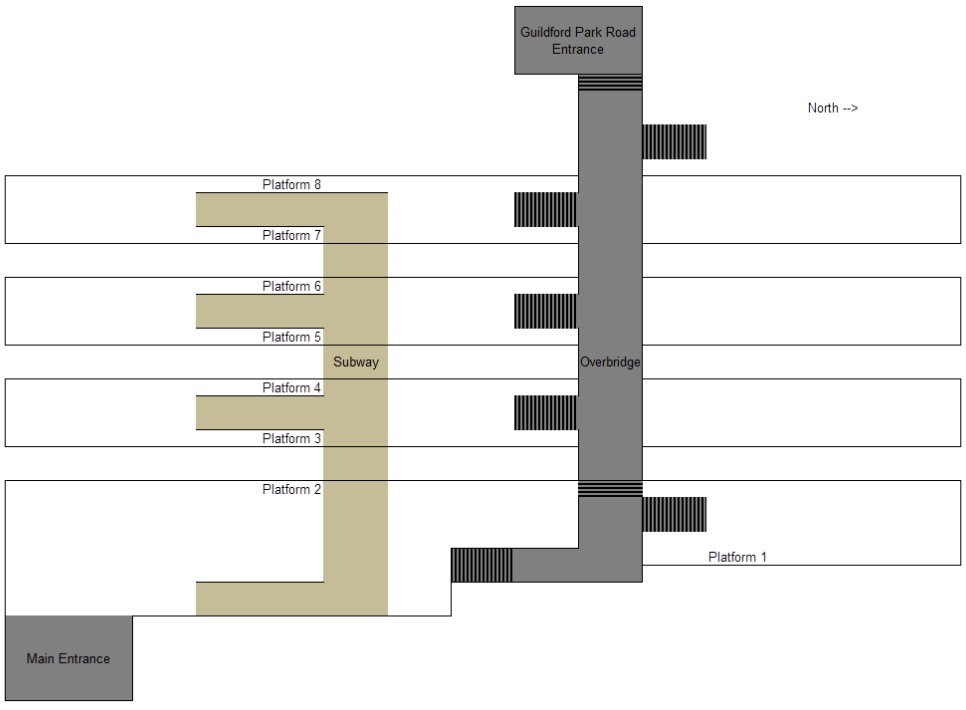
B.01 Guildford Station

Guildford station sits at the junction the Portsmouth Direct Line (PDL) and the North Downs Line (NDL), the Guildford New Line (GNL) also terminates at the station from the north. The station is served by South Western Railway (SWR) services between London Waterloo and Portsmouth on the PDL and by Great Western Railway (GWR) services between Reading and Gatwick Airport on the NDL. SWR stopping services between Guildford and London Waterloo operate via the GNL. In addition to this there are also SWR services operating between Guildford and Ascot via the NDL and a handful of Southern services between Guildford and London Bridge and London Victoria via the GNL.

The range of services available from the station means that the station is used by interchange passengers as well as those travelling to and from Guildford. As well being a commuter town, Guildford is also a destination in its own right meaning that large numbers of passengers enter and exit the station during the peak periods.

The station has entrances on its east and west side, the main entrance is on the east facing the town centre and the secondary entrance facing the University of Surrey and Guildford Cathedral. Figure 2 shows a simplified diagram of the station layout.

Figure 2– Station Layout



The two entrances are linked by a footbridge that serves all the platforms, the footbridge is not step-free and also is a public right-of-way for which passes are issued at the station

gatelines. A subway links the main entrance with each of the platforms via ramps, while this provides step-free access the ramps themselves are unlikely to be compliant with relevant accessibility standards[1], being steep and not having landings.

B.02 Study Purpose

This study will assess the station to identify what will be needed in terms of station capacity to accommodate forecast 2043 demand. A "high-level" approach will be taken to assess the station with a view to informing more detailed analysis in the future.

B.03 Other Station Interventions

Planning approval has been received for the Solum redevelopment of the eastern side of the station to provide a new station building, 438 new homes and office space.

Part C: Approach

C.01 Passenger Demand Data

This study uses forecast 2043 passenger demand taken from MOIRA, a rail industry passenger demand forecasting model. An explanation of the development of this forecast is provided in Appendix A.

Table 4 and Table 5 provide a summary of the current and forecast levels of AM and PM peak demand as well as the number of services at the station in each scenario.

Table 4 – AM Peak Demand (06:30-09:30)

Scenario	Number of Services	Total Ons	Total Offs	Total Ons and Offs
Base (December 2017 Timetable)	81	3730	4336	8067
2043 Forecast	117	5331	6515	11846

Table 5 – PM Peak (16:00-20:00 Demand)

Scenario	Number of Services	Total Ons	Total Offs	Total Ons and Offs
Base (December 2017 Timetable)	103	6243	6295	12538
2043 Forecast	149	8601	8910	17511

[1] Design Standards for Accessible Railway Stations, Department for Transport and Transport Scotland

C.02 Train Service

Platform usage at Guildford currently follows the pattern shown in Table 6 fairly consistently, for the purposes of this analysis it is assumed that similar usage will continue in 2043.

Table 6 – Platform Usage

Platform	Routes Served
0,1&2	Guildford New Line terminating services
3&4	Portsmouth Direct Line towards Portsmouth
5&6	Portsmouth Direct Line towards London / North Downs Line towards Gatwick / Ascot terminators
7&8	North Downs Line towards Reading

C.03 Assessment Approach

Static analysis has been used to assess the station. The assessment criteria are in keeping with overarching principles outlined within Network Rail's Station Capacity Planning Guidance (NR-SCPG).

The assessment criteria for passenger circulation are based on Fruin's Levels of Service ranges that are defined within NR-SCPG and the minimum criteria listed below have been applied to interpret the analysis outputs.

Figure 3– Station Capacity Planning Criteria

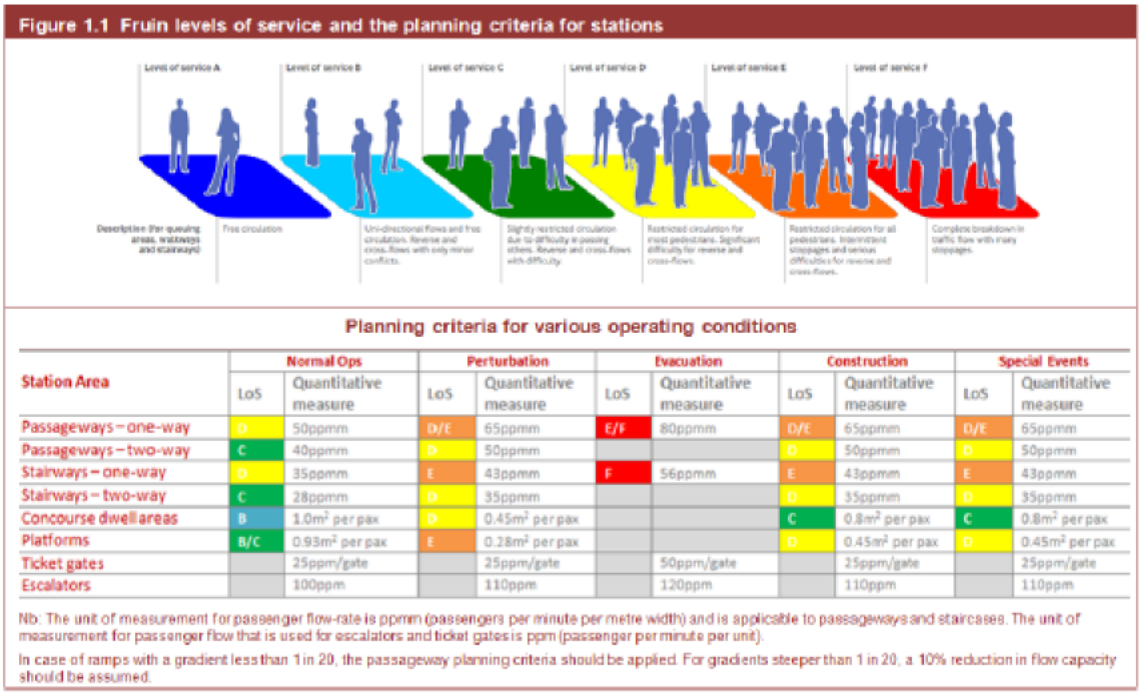


Figure 1.1 Fruin levels of service and the planning criteria for stations

Planning criteria for various operating conditions

Station Area	Normal Ops		Perturbation		Evacuation		Construction		Special Events	
	LoS	Quantitative measure	LoS	Quantitative measure	LoS	Quantitative measure	LoS	Quantitative measure	LoS	Quantitative measure
Passageways – one-way	D	50ppmm	D/E	65ppmm	E/F	80ppmm	D/E	65ppmm	D/E	65ppmm
Passageways – two-way	C	40ppmm	D	50ppmm			D	50ppmm	D	50ppmm
Stairways – one-way	D	35ppmm	E	43ppmm	F	56ppmm	E	43ppmm	E	43ppmm
Stairways – two-way	C	28ppmm	D	35ppmm			D	35ppmm	D	35ppmm
Concourse dwell areas	B	1.0m² per pax	D	0.45m² per pax			C	0.8m² per pax	C	0.8m² per pax
Platforms	B/C	0.93m² per pax	E	0.28m² per pax			D	0.45m² per pax	D	0.45m² per pax
Ticket gates		25ppm/gate		25ppm/gate		50ppm/gate		25ppm/gate		25ppm/gate
Escalators		100ppm		110ppm		120ppm		110ppm		110ppm

Nb: The unit of measurement for passenger flow-rate is ppmm (passengers per minute per metre width) and is applicable to passageways and staircases. The unit of measurement for passenger flow that is used for escalators and ticket gates is ppm (passenger per minute per unit).

In case of ramps with a gradient less than 1 in 20, the passageway planning criteria should be applied. For gradients steeper than 1 in 20, a 10% reduction in flow capacity should be assumed.

C.04 Caveats

While the MOIRA data used in the analysis provides a forecast of the numbers of passengers boarding and alighting each service, it doesn't provide information about the proportion of passengers who interchange between services nor which entrance passenger entering and exiting the station use.

The forecast data also doesn't include passenger demand growth resulting from housing developments around Guildford, this could increase demand at the station further than forecast.

Finally the amount of non-rail demand using the station, to cross the footbridge, is not currently known. An increase in this could worsen some congestion issues at the station.

Part D: **Analysis**

Analysis of the station focuses firstly on issues that can currently be identified at the station based on site visits and feedback from station management. Secondly the forecast 2043 demand will be used to test the various station elements to identify what will be needed for the station to accommodate that demand.

D.01 Current Station Issues - Footbridge

The station footbridge as a number of deficiencies, as mentioned previously it is not step-free which leads to the station being inaccessible from the west for station users who require step-free access.

As Figure 4 shows, the footbridge deck itself is quite narrow (around 3 metres, NR-SCPG recommends a minimum width of 2.2 metres) which means it has limited capacity to accommodate demand from the platforms. In addition to this it is also used as a public right-of-way across the station. The SWR station manager has reported that both of these factors lead to congestion occurring on the footbridge.

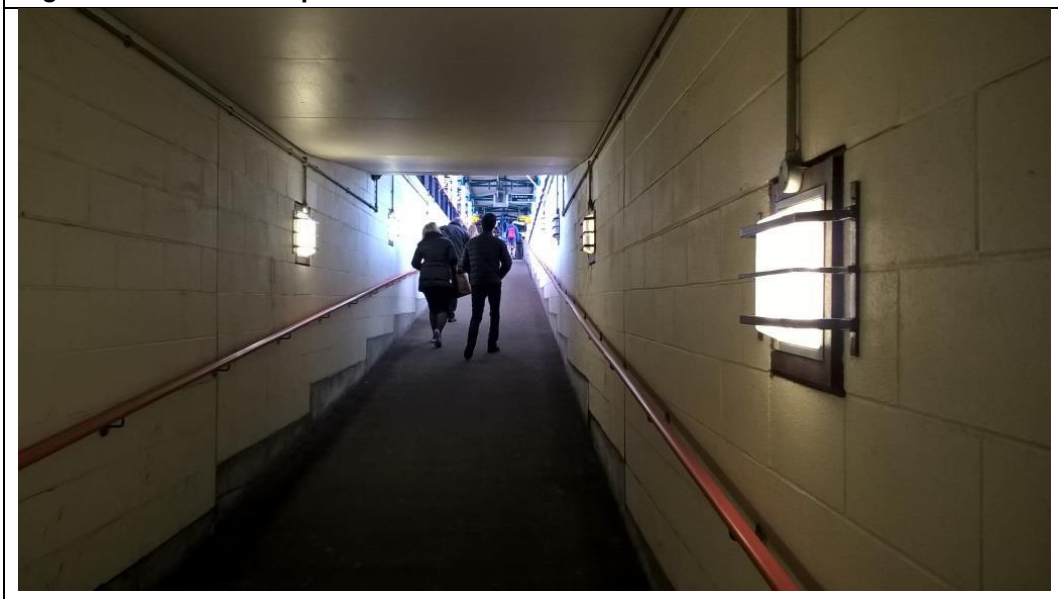
Figure 4 also shows the limited run-off available from the tops of the stairs onto the footbridge. Run-off is important as it provides space for orientation time to allow passengers to move clear of stair and decide where to go next as well providing queuing space where passengers can accumulate safely.

NR-SCPG recommends at least 4 metres of run-off should be provided in this situation, at Guildford there is less than 1 metre. This could lead to passenger using the stairs disrupting cross-flows on the footbridge (and vice versa) leading to congestion.

D.02 Current Station Issues – Subway

The subway provides at step-free means of accessing Platform 3-8 from the main station building. However, as Figure 5 shows, the ramps leading into the subway are steep and long without providing any landings. They are unlikely to be compliant with relevant accessibility standards[2] and so would still represent an obstacle for persons with reduced mobility (PRMs).

Figure 5 – View of ramp



Additionally, as Figure 6 shows, there are blind corners and limited run-off space at the bottom of the ramps into the subway. This creates potential for collisions to occur, especially if passengers are rushing to catch a train.

[2] Design Standards for Access ble Railway Stations, Department for Transport and Transport Scotland

Figure 6 – View of subway

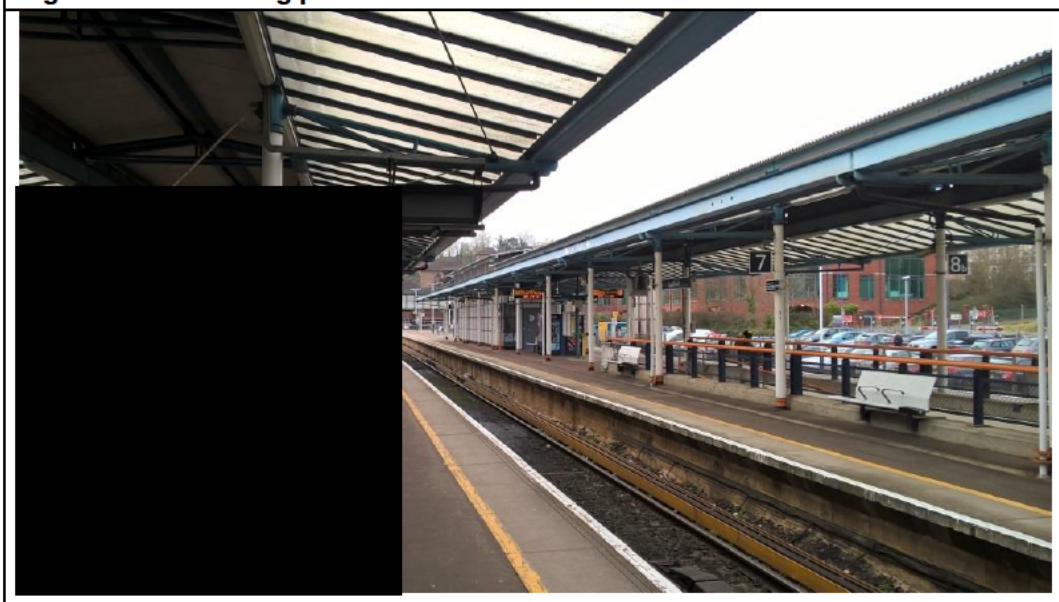
D.03 Current Station Issues – Platforms

The voids on the platforms created by the ramps lead to the central sections of the island platforms being only slightly wider than the minimum standard of 2.5 metres[3]. Seats and other platform furniture located in these areas reduce the available widths further.

Figure 7 shows that, looking at a cross-section of the platform, the is only space for two rows of passengers to wait in these areas, any additional passengers will have to wait or circulate in the “yellow line” zone close to the platform edge.

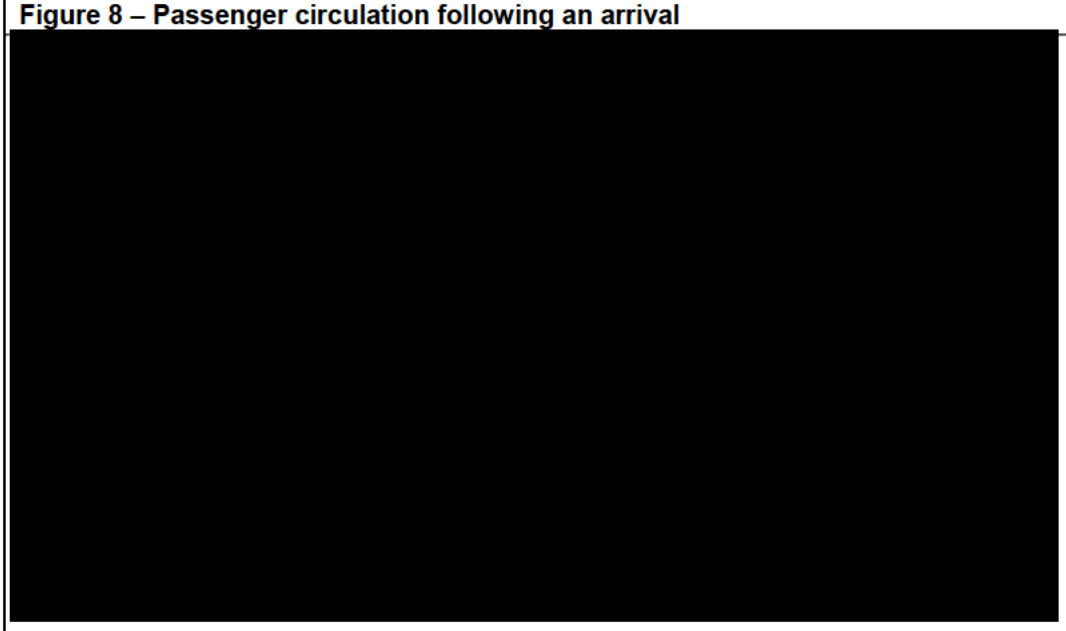
[3] Railway Safety Principles and Guidance, Part 2b, ORR and the Railway Group Standard GI/RT/7016, RSSB.

Figure 7 – View along platform



When a train arrives, the limited width leads to congestion occurring as alighting passengers attempt to access the footbridge or subway while boarding passenger attempt to board the train.

Figure 8 – Passenger circulation following an arrival



D.04 Future Station Issues – Platform Clearance

The stairs and ramps from each of the island platforms will come under most pressure from alighting loads as large numbers of passengers attempt to leave the platform. Boarding passengers tend to arrive at platform over a longer duration.

In the 2043 demand forecast, the largest alighting loads come from PDL services from Waterloo during the PM peak, which are assumed to arrive on the P3&4 island. Eight services are forecast to have over 200 alighting passengers.

Since the footbridge provides access to both station exits and the stairs have a lower capacity than the ramps, queuing is most likely to occur at the base of the stair on P3&4.

Depending on the proportion of passengers who choose to use the stair to leave the platform, the queuing for the stair following the largest alighting could last for ~2 to 3 minutes. If a significant number of boarding passengers were also using the stair to access the platform, the queuing time could increase to ~4 minutes.

While this means that on this basis the platform is likely to clear before the next service arrives on the platform, as Figure 9 shows there is limited queuing space on the platform currently.

Figure 9 – PM peak stair queuing

As around a third of the platform length is beyond the stair, passengers alighting at the London end of the platform have to turn through 180 degrees to ascend the stair, this creates a bunching effect. With forecast 2043 demand, this bunching would lead to passengers queuing to the platform edge for the duration of the queue. This would create a safety risk as well potential to affect train performance if trains can't be dispatched safely.

D.05 Future Station Issues – Footbridge

With an increase in passenger demand congestion on the footbridge would worsen, particularly if with an increase in train frequency were to occur as concurrent arrivals on different platform islands as more passengers would be using the footbridge at the same time.

The issues already identified with the footbridge, a narrow width and a lack of run-off from the stairs would exacerbate this.

Any increase in demand at the station's eastern entrance, either by passengers or non-rail users would cause more passengers to use the footbridge as this is the only means of accessing the entrance. With no step-free access available to this entrance, PRMs will continue to be inconvenienced unless a step-free route can be provided.

D.06 Future Station Issues – Subway

While the subway does provide a step-free route to the station's western entrance, issues have already been identified with the steepness of the ramps and the blind corners into the subway. With an increase in demand, there is an increased risk of collisions occurring.

D.07 Future Station Issues – Platform Widths

The central sections of the island platforms are narrowed due to the voids for the subway ramps, these sections are also likely to see most usage as the ramp and stair on each island feed passengers into these sections and all trains regardless of length stop in these sections.

Based on the 2043 forecast demand, platform width issues for the Waterloo bound services on the PDL have been identified; it is assumed these services will continue to use the P5&6 island. This shortfall in width is likely to manifest itself in passengers needing to walk along the platform edge to circulate on the platform and the risk of increased dwell times as alighting and boarding takes longer due to congestion.

Part E: Conclusions

E.01 Existing Station Layout

A summary of the station capacity issues identified at the station in provided in Figure 10 and the significant and moderate potential capacity concerns are explained in more detail in Table 7 and Table 8.

Figure 10– Station Capacity Summary with 2043 Forecast Demand

Table 7 – Significant Potential Capacity Concerns

Location	Concern
Footbridge	An increase in the number of passengers and non-rail users using the footbridge to interchange and access the station entrances could lead to increased congestion. The lack of stair run-offs disrupt cross-flows currently, this will only worsen with increased demand. Any queuing that occurs on the footbridge has the potential to lead to queues occuring on stairs.
P3&4 Stair	An increase in the alighting loads from Portsmouth bound services has the potential to lead to queuing occuring on the platform for a significant duration. This could lead to passengers queuing to the platform edge, creating a safety risk and potentially affecting train performance.
P5&6 Width	An increase in boarding demand for fast Waterloo bound services could see the central sections of this platform island become congested forcing

	passengers to walk along the platform edge and increasing the risk to their safety. Additionally this could slow the alighting and boarding process, increasing train dwell times.

Table 8 – Moderate Potential Capacity Concerns

Location	Concern
Footbridge	The lack of step-free access from the western station entrance creates a barrier to a number of station users, both passengers and non-rail users, who are unable to access the station from this side. This leads to longer journey times as a longer route via the public highway is needed to reach the more accessible eastern side of the station.
Subway	While the subway provides a step-free route to the platform, its non-compliant design creates another barrier to PRMs. An increase in demand increases the risk of accidents occurring due to the blind corners or passenger rushing.

Areas identified has having minor or no potential capacity concerns are expected to continue to operate well with an increase in demand or in the case of the main entrance, any congestion issues are assumed to be resolved by the Solum redevelopment.

E.02 Intervention Phasing

The lack of step-free access from the west and the steepness of the ramps are two issues that could be improved by an immediate intervention. Increased accessibility at the station would be beneficial for all station users and other station capacity improvements could be tied in with this.

The phasing of other station capacity interventions, aside from accessibility improvements, will be closely tied to train service increases. This analysis has been based on 2043 forecast demand with an enhanced train service, were the enhancement to occur sooner it would be likely that the intervention would be needed sooner. For instance, if more concurrent arrivals were to occur due to the increase in service frequency, more pressure would be placed on the footbridge as there would be shorter gaps between passenger loads using the footbridge.

Were only minor service enhancements to occur and passenger demand increased at a steady rate, it is anticipated that this growth could be accommodated within the existing layout of the station through Control Period 6. However the performance of the station should continue to be monitored through regular feedback from station management and the TOCs operating at the station.

Part F: **Recommendations**

Having identified the capacity concerns, the following recommendations can be made.

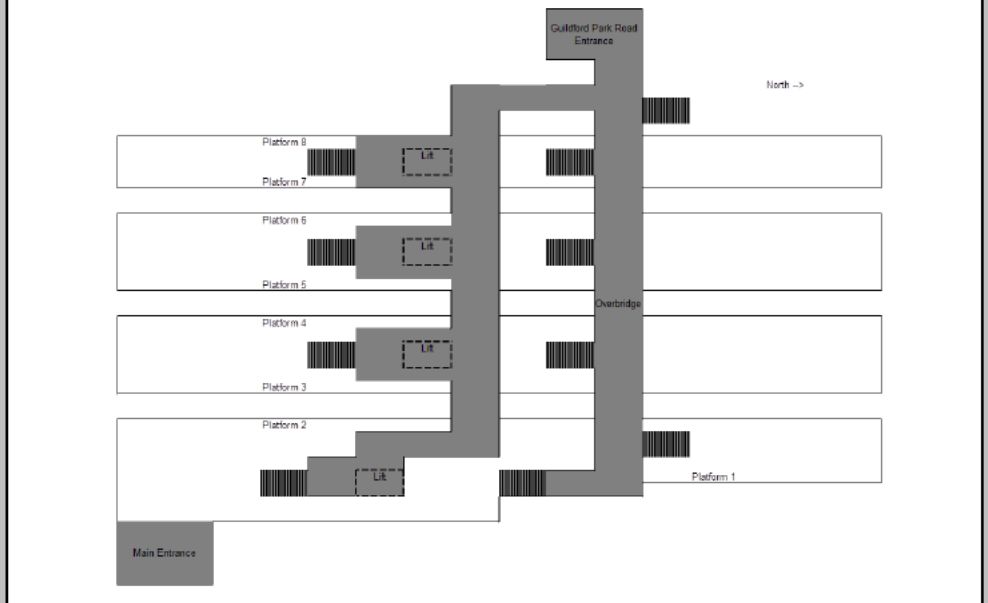
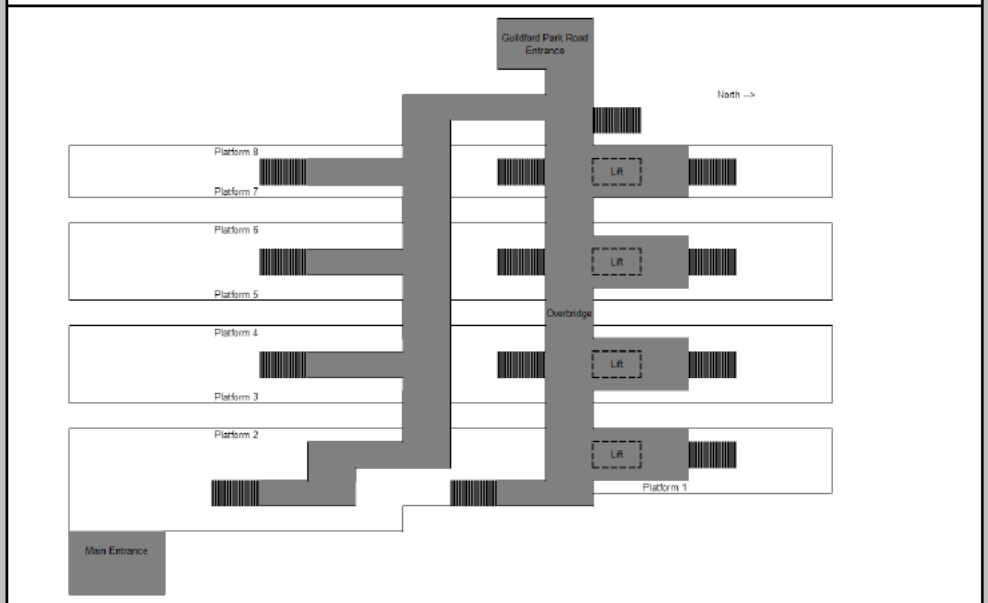
#	***Recommendations***
1	Provide step-free access, ideally lifts, across the station, this will improve accessibility to for all station users by removing the current barriers.
2	As a means of providing step-free access, the existing footbridge could be replaced with a wider structure that includes lifts and additional stairs. This would have potential to alleviate the significant capacity concerns identified in Table 7 by: • Reducing footbridge congestion; • Reducing queuing on the platforms by increasing the stair capacity from the platforms; • Reducing congestion on the platforms by providing further platform accesses to help spread dwelling passengers.
3	The subway could be replaced with a new accessible footbridge linking with an enhanced version of the existing footbridge. Removing the subway would enable more platform space to be provided as the ramp voids would be covered over. This would also remove the non-compliances and safety issues connected to the subway. A similar alteration has occurred at East Croydon. Figure 11– Station with accessible footbridge replacing subway 
4	Both of these options could be combined to further increase the stair capacity to the platforms and help to both encourage boarding passengers to spread further on the platforms and reduce the amount of distance alighting passengers have to walk before leaving the platforms.

	Figure 12– Station with both subway and footbridge replaced  	
5	Were the track layout to be altered significantly, widening some of the platforms would enable passenger dwelling space to be increase. However, based on the timetable study, significant track layout changes are unlikely to be required to accommodate additional train services. Removing the subway and covering the ramp voids would provide additional dwelling space while training the same track layout.	
6	If there were opportunity to change the platforms that services arrive into (through new platforms or timetable changes), increasing the use of Platform 2 by PDL services could be beneficial as that platform is generally wider than the island platforms and has access to the main entrance without needing to use the footbridge/subway.	

Part G: **Opportunities and Next Steps**

#	***Opportunities***
1	With the Solum development funding a new station building, further station improvements could be partially funded through more developments on Network Rail owned land. This could take the form of an along site development (ASD) to the east of the station or an over site development (OSD) above the station.
2	An access for all (AfA) scheme to could be partially funded by contributions from local authorities, developers and other interested parties.

#	*Next Steps*
1	Station capacity performance should continue to be monitored to see if the issues identified in this analysis worsen. Feedback can be provided by the station's management team or by the TOCs operating at the station.
2	If further station capacity analysis is undertaken, more detailed demand information, such as passenger demographics, entrance usage and amount of interchange demand should be captured with a survey.
3	Incorporating the new western platform, as identified as a requirement in the timetable study, will require further station capacity analysis to enable passenger demand to be accommodated.

Part H: Intervention Requirements

H.01 Stairs

The capacities of the current ramp and stair from each of the island platforms are shown in Table 9.

Table 9 – Stair and Ramp Capacity for P3&4, 5&6, 7&8

	Passenger capacity (per minute)
Stair	80
Ramp	115
Total	**195**

Assuming any new stair(s) would have the same clear width (2.85m) as the existing stair, to replace the ramps we would need the following number of stairs.

Table 10 – Passenger capacity needed to replace ramps

Option	**Total number of stairs needed**	**Capacity provided (per minute)**
Retain existing capacity	3	240
To increase capacity by 50%	4	320

A metre of ramp can process more people than a metre of stair so additional stairs would be needed to make up the shortfall. Three 2.85m stairs would cover this as well as providing additional capacity to accommodate some growth. Four 2.85m wide stairs would increase the existing egress capacity by 50%.

H.02 Footbridge

In terms of providing additional footbridge capacity, the width required is dependent on the number of stairs directly feeding it. If multiple stairs are provided, more passengers can flow onto the footbridge and more width would be need needed.

On the basis that a footbridge with a similar design to the existing is provided (rather than transfer deck similar to that provided at Reading) it would have enough capacity to accommodate alighting loads from services arriving at the same time on multiple platforms. The existing footbridge is 3m wide which would have sufficient capacity for one stair but little more than that.

The following footbridge widths would be needed to accommodate various amounts of alighting demand.

Table 11 – Footbridge width required to accommodate demand from platforms

Footbridge width to accommodate:	Footbridge width required (m)
3 Stair-loads	7
4 Stair-loads	10

At worst, two services could arrive at the same time on P3-8 with significant alighting loads, this would need a minimum of 5m to accommodate them. On top of that allowance would also need to be made for demand going to the platforms and non-rail demand (if the existing footbridge is replaced), as well as space to view customer information screens. This would add an additional 2-3m which would bring the total width to 7-8m.

The footbridge at Clapham Junction is between 5-8m in width, Network Rail's CP6 scheme planned to replace the 3m subway with a 10m footbridge, leaving a total footbridge width of 15-18m. On this basis it is estimated that 7-8m would be reasonable at Guildford. Further analysis is needed to validate this.

Allowance would also be needed for 4m of run-off space from each stair.

Part I: **Appendix A**

I.01 Guildford 2043 Demand Forecast

Objective

The objective of this exercise was to model current demand and demand in 2043 at Guildford, employing MOIRA, to inform a station strategy to respond to potential growth. The demand forecast captures expected step changes to services calling at Guildford within the forecast period and utilises counts data to calibrate the MOIRA output.

Method

- Dec 2017 Moira Timetable Ons and Offs at Guildford were calibrated using GWR OTA/OTD counts and SWR Ons/Offs counts.
- MOIRA 2043 timetable produced using step changes set out in the remit which include:
    - 2 additional semi-fast Gatwick to Reading tph on the North Downs line throughout the day.
    - 1 additional Haslemere to Waterloo, Havant to Waterloo, and Guildford to Waterloo tph on the South West Mainline in the high peak.
    - 1 additional Haslemere to Waterloo, Havant to Waterloo, and Portsmouth Harbour to Waterloo tph on the South West Mainline throughout the day.
- Calibrations from the current timetable were used to calibrate the 2043 timetable. Services were grouped according to the line they use, their direction and whether they pass through or stop at Guildford in attempt to produce a more accurate/less variable calibration.
- Ons and Offs demand growth was then forecast using the London and South East Market Study growth projections, with growth rates applied to corresponding lines.

Assumption

- The impact of housing development was not included because the Wessex Route Study makes reference to housing development and the market study growth rates are based on Railplan which makes reference population growth/housing delivery.
- The 2018/2020 SWR consultation document didn't have any significant changes to service pattern for Guildford services

Outputs

- Calibrated Base (current) ONS and OFFS at Guildford
- Calibrated 2043 (new) ONS and OFFS at Guildford

- Available: G:\PandR\Economics and Strategic Analysis\Demand Forecasting\Misc Requests for Analysis\Guildford Station Counts\Guildford Model.xlsx

Source

- **MOIRA base:** OR18: DfT Southern (W) Dec 2017. G:\PandR\Economics and Strategic Analysis\Demand Forecasting\Misc Requests for Analysis\Guildford Station Counts\03 Guildford Model Inputs\Base Timetable from MOIRA DEC 2017 (WED Full Day) OR18.CSV

- **MOIRA 2043 Timetable**: 'Guildford 2043 inc sens 2' submitted in OR18: DfT Southern (W) Dec 2017. G:\PandR\Economics and Strategic Analysis\Demand Forecasting\Misc Requests for Analysis\Guildford Station Counts\03 Guildford Model Inputs\Guildford 2043 from MOIRA including additional trains OR18.CSV

- **GWR Counts**: G:\PandR\Economics and Strategic Analysis\Demand Forecasting\Misc Requests for Analysis\Guildford Station Counts\03 Guildford Model Inputs\Counts Timetable from GWR.xlsx

- **SWR Counts**: G:\PandR\Economics and Strategic Analysis\Demand Forecasting\Misc Requests for Analysis\Guildford Station Counts\03 Guildford Model Inputs\Counts Timetable from SWR.xlsx

- **Model**: G:\PandR\Economics and Strategic Analysis\Demand Forecasting\Misc Requests for Analysis\Guildford Station Counts\Guildford Model.xlsx