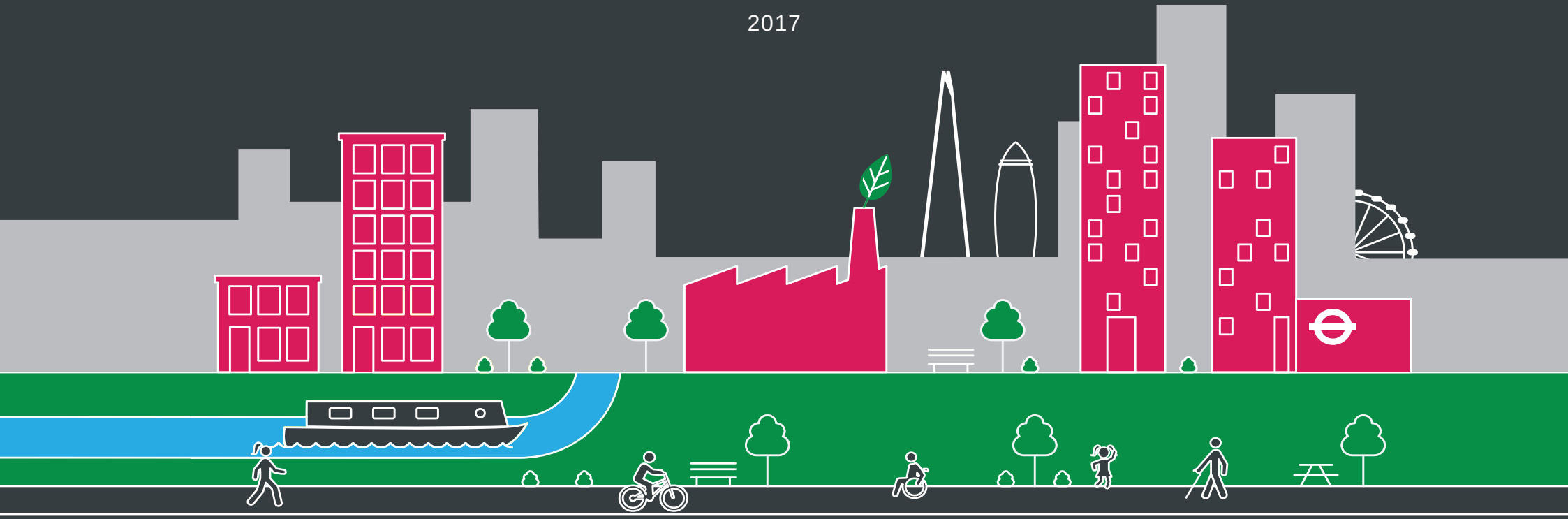
OPDC
OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

Willesden Junction Station Feasibility Study

LOCAL PLAN SUPPORTING STUDY

2017



MAYOR OF LONDON

50. Willesden Junction Station Feasibility Study

Document Title	Willesden Junction Station Feasibility Study
Lead Author	Atkins
Purpose of the Study	To produce a feasibility study into Willesden Junction Station and Interchange to GRIP 2 level
Key outputs	• Options for range of station elements (entrances, interchanges arrangements, intermodal strategy and over/adjacent site development potential) for Willesden Junction improvements. • Dynamic pedestrian flow modelling • Costing and phasing sequences for each option • Stakeholder responses from workshop • Summary of appraisals and relative strengths of each option in implementing upgrade of Willesden Junction Station and interchange.
Key recommendations	The study provides 10 key recommendations: • Capacity enhancements required to accommodate future growth; • Major improvements to station required to meet passenger expectations as an interchange and as a destination in Old Oak area; • Step free access from all entrances to platforms should be provided; • Enhanced intermodal facilities are required with adequate bus, cycle parking and taxi/kiss-and-ride provision located in close proximity to station entrances; • A new primary entrance to the east side of the station is required to provide convenient access to major development areas to the south in Old Oak; • Pedestrian and cycle links to Harlesden Town centre via Station Road and Harrow Road mist be enhanced; • Delivery of an east-west unpaid pedestrian and cycle route through, or adjacent to, the station; • Deliver capacity and public realm improvements early in order to enhance the viability of adjacent development plots; • The future use of Willesden Train Maintenance Depot needs to be determined to inform the next phase of station design; • Ensure proposals safeguard the ability to integrate a vehicular link over the West Coast Mainline
Relations to other studies	Interfaces with Old Oak Strategic Transport Study, Bus Strategy and Public Realm, Walking and Cycling Strategy.
Relevant Local Plan Policies and Chapters	• Policy SP6 (Places and Destinations) SP7 (Connecting People and Places) • Policy P2 (Old Oak North), P10 (Scrubs Lane), P11 (Willesden Junction) • Transport chapter

ATKINS WestonWilliamson+Partners



Willesden Junction Station and Interchange

Local Area Plan Supporting Study

COSTAIN BILFINGER GVA FAITHFUL+GOULD CONSTRUCTIVE EXPERTISE

Notice

This document and its contents have been prepared and are intended solely for TfL's information and use in relation to Willesden Junction Station and Interchange.

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1.0 EXECUTIVE SUMMARY

In May 2016 Atkins were commissioned by TfL, OPDC and the London Borough of Brent to lead a feasibility study into Willesden Junction Station and Interchange to GRIP 2 level. The Atkins' team comprised of WestonWilliamson+Partners on architecture, Bilfinger GVA on development appraisal, Costain on constructability and Faithful+Gould on costing. This document, the Local Area Plan Supporting Study, is an output from the feasibility study.

The study was carried out in three distinct phases:

- reviewing and assessing the existing situation.
- developing a range of station elements (entrances, interchange arrangements, pedestrian routes, intermodal strategy and over/adjacent site development potential) in response to these findings which could be both technically appraised and assessed by stakeholders.
- creating and assessing options for the station and environs from combinations of elements, both technically and through a 'round table' stakeholder scoring workshop.

In parallel with these activities, existing and forecast usage was provided by TfL in distinct scenarios across time (present day, 2026 and 2041) and covering combinations of development (HS2 station at Old Oak Common, with and without additional London Overground stations at Hythe Road and Old Oak Common Lane, OPDC development). These scenarios indicated that significant uplift in usage occurred with the OPDC development in 2041, with increases of 123% in the AM peak and 176% in the PM peak. In the light of these significant increases and of static analysis of the existing station, the team agreed with the client to consider the 'worst case' uplift of HS2 and OPDC development without additional London Overground stations as the design case for the emergent options.

Significant rail infrastructure exists around Willesden Junction Station and the nature and usage of each was evaluated. In discussion with the client and in light of the 2041 design case, it was agreed to predicate the station options on the removal of the current London Overground Train Maintenance Depot (TMD) by 2041. This decision also assists in the provision of development area for the study. However, this study has also considered the possibility that the TMD must remain in place, and has posited how the development may either be phased or modified to accommodate this eventuality.

The emergent options – entitled 'Central', 'Dual' and 'Offset' through the nature of their entrances and concourses – were tested against rail and station operations; urban realm; intermodal provision; and civil and structural engineering. Dynamic pedestrian flow modelling was also undertaken for each option to test performance under the predicted peak usage.

The options were also indicatively costed and possible phasing sequences were developed to illustrate the build-out of the enhanced station across time. The study found that the potential for over and adjacent site development is broadly similar for each option and the analysis indicates the benefit in phasing the development to generate enhanced value.

The study captures the responses of the major stakeholder workshops – at element stage and at option stage – along with supplementary stakeholder engagement through the Harlesden Town Centre Forum and the OPDC PLACE (Planning, Landscape, Architecture, Conservation and Engineering) Review Panel.

The feasibility study concludes with a summary of the appraisals indicating the relative strengths of each option and also gives recommendations for the next steps in implementing the upgrade of Willesden Junction Station and Interchange. The recommendations resulting from the study, agreed in conjunction with the Client Group, are summarised below.

Key Recommendations

1. Capacity enhancements are required at the station to accommodate future growth, with passenger numbers forecast to more than double in the morning peak and nearly triple in the evening peak by 2041. Station upgrades could be delivered in a phased manner to best facilitate this as a comprehensive plan.
2. Major improvements to the station are required to meet passenger expectations as an interchange and as a destination to the Old Oak area. The design should improve the passenger experience, facilities, wayfinding and public realm within and surrounding the station.
3. Step free access from all entrances to platforms should be provided to ensure any route to, from or through the station is accessible to all.
4. Enhanced intermodal facilities are required, with adequate bus, cycle parking and taxi/kiss-and-ride provision located in a high quality interchange area close to station entrances which enhances the sense of arrival.
5. A new primary entrance to serve the east side of the station is required to provide convenient access to the major development areas to the south in Old Oak and seamless interface with the proposed Old Oak High Street, in addition to an improved existing entrance serving Station Road to link into Harlesden as well as providing improved access to Harrow Road.
6. Pedestrian and cycle links to Harlesden town centre via Station Road and Harrow Road must be enhanced to ensure the station is better connected to existing local communities.
7. Delivery of an east west unpaid pedestrian and cycle route through, or adjacent to, the station. The link should be direct, step free, safe, open 24 hours and well integrated into the wider public realm. The most appropriate way of delivering this at a high level or low level needs to be determined.
8. Deliver capacity and public realm improvements early in order to enhance the viability of adjacent development plots and support Old Oak becoming a major new commercial and high-density residential centre. Changes should seek to optimise development opportunity on and/or adjacent to the stations and tracks and ensure the station is seamlessly integrated with the development of the wider area to ensure it acts as part of the surrounding townscape through investment in the public realm.
9. The future use of Willesden Train Maintenance Depot (TMD) needs to be determined to inform the next phase of station design, which could see it retained in this location or potentially relocated to an alternative location.
10. Ensure proposals safeguard the ability to integrate a vehicular link over the West Coast Main Line (WCML) and any potential WCML platforms at Willesden Junction as part of the future station, to enhance accessibility and connectivity.

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2.0 INTRODUCTION

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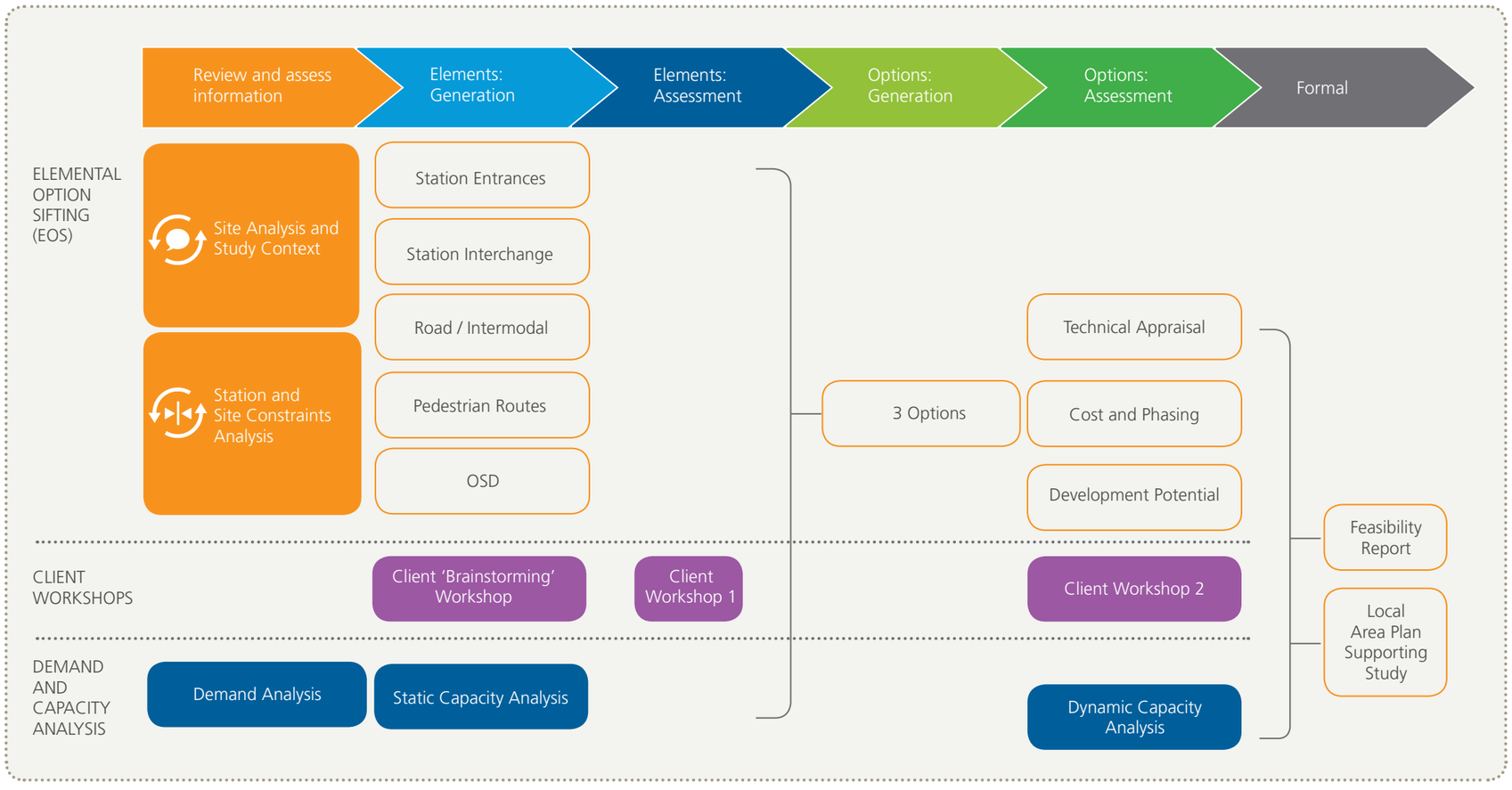
2.1. FEASIBILITY STUDY (GRIP 2)

Atkins were commissioned by Transport for London (TfL) to lead a project team with WestonWilliamson+Partners (Architects), Faithful+Gould (Quantity Surveyors), Costain (Construction advisors) and BGVA (Development Appraisal) to assist TfL, Old Oak and Park Royal Development Corporation (OPDC) and London Borough of Brent (LBB) in identifying the options for upgrading Willesden Junction Station.

The commissioning stakeholder group were keen to understand the potential options for upgrading and/or rebuilding the London Overground station in the west of London.

The station is located within the Old Oak and Park Royal Opportunity Area which means that the station is expected to be subject to a significant and rapid increase in demand in the forthcoming years as the surrounding urban environment develops. The station itself is a Network Rail Freehold Property, operated by TfL.

The study investigated elements of station, as indicated by the diagram below. These were assessed and subsequently combined into three distinct options. The options were appraised technically and recommendations for future actions given.

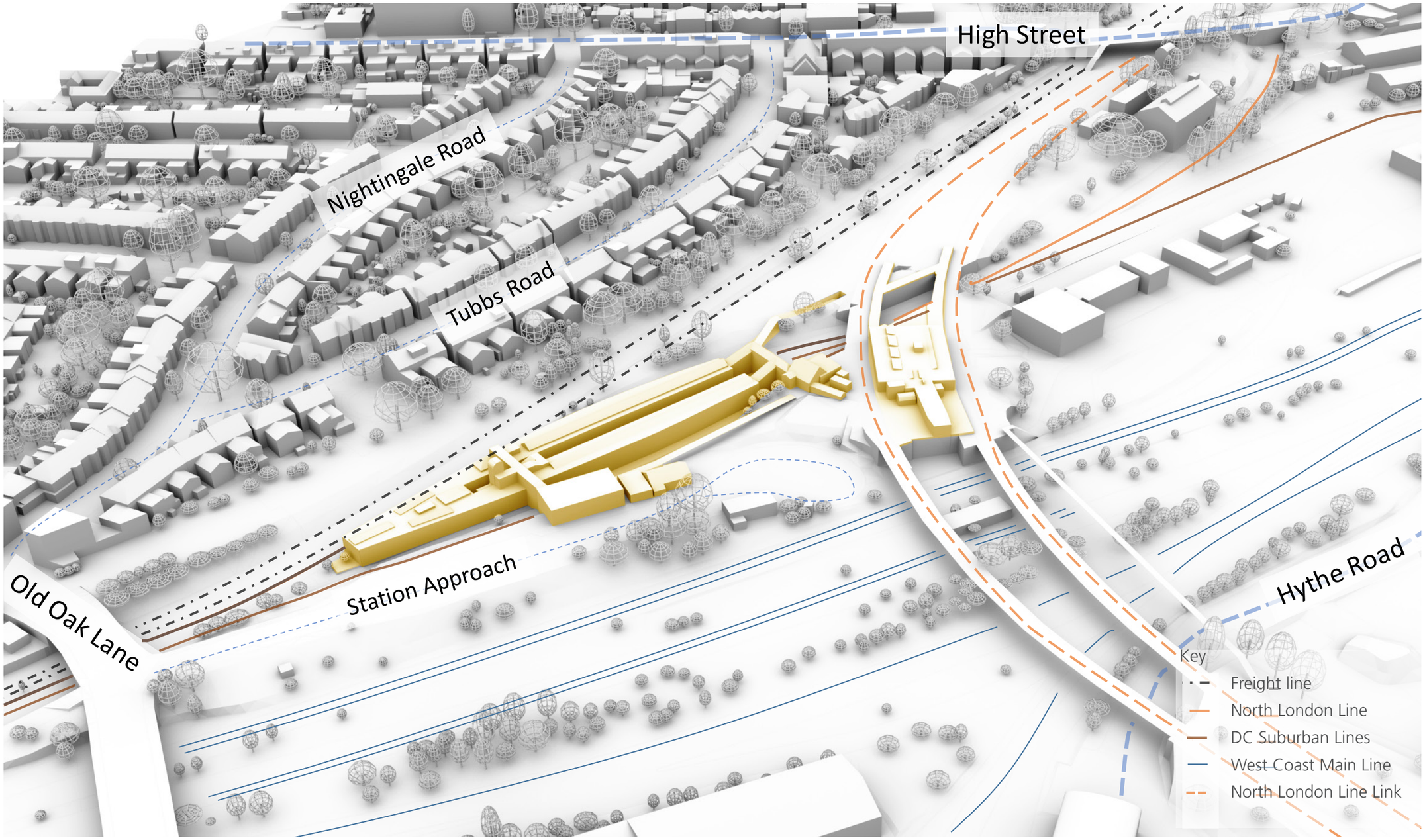


EOS process diagram

2.2. OBJECTIVES

The objectives of the study were to:

- Assess the impact of development and other transport infrastructure projects on forecast demand growth at Willesden Junction.
- Identify and assess a range of potential options for improving station capacity, step-free access, customer facilities operations and ensure that the station adds to the wider permeability of the OPDC area.
- Identify opportunities for improved interchange with other public transport modes, taxis and cycles in the immediate vicinity of the station.
- Ascertain the engineering viability of the identified proposals in terms of constructability and the key constraints.
- Ascertain cost estimates for the proposals.
- Assess the operational impact of works, including any track or station closures.
- Assess the opportunities for high quality public realm that integrate with aspirations for wider connectivity, local green spaces and the environmental aspirations for the area.
- Assess the potential commercial/over site development (OSD) opportunities within, over or near the station premises and highlight any constraints that may have an impact on future OSD with the site boundary.



Overview of Existing Area



Study area considered by design team.

2.3 FORMAT OF LOCAL AREA PLAN SUPPORTING STUDY

This report briefly describes the existing conditions at Willesden Junction and the future demand anticipated (sections 3.0 and 4.0). It subsequently describes the three Options which have been developed in response to these and gives details of the technical appraisals carried out (sections 5.0, 6.0, 7.0). Notes on the stakeholder consultation undertaken to date are given in section 8.0 and a summary and next steps for the project are given in section 9.0.

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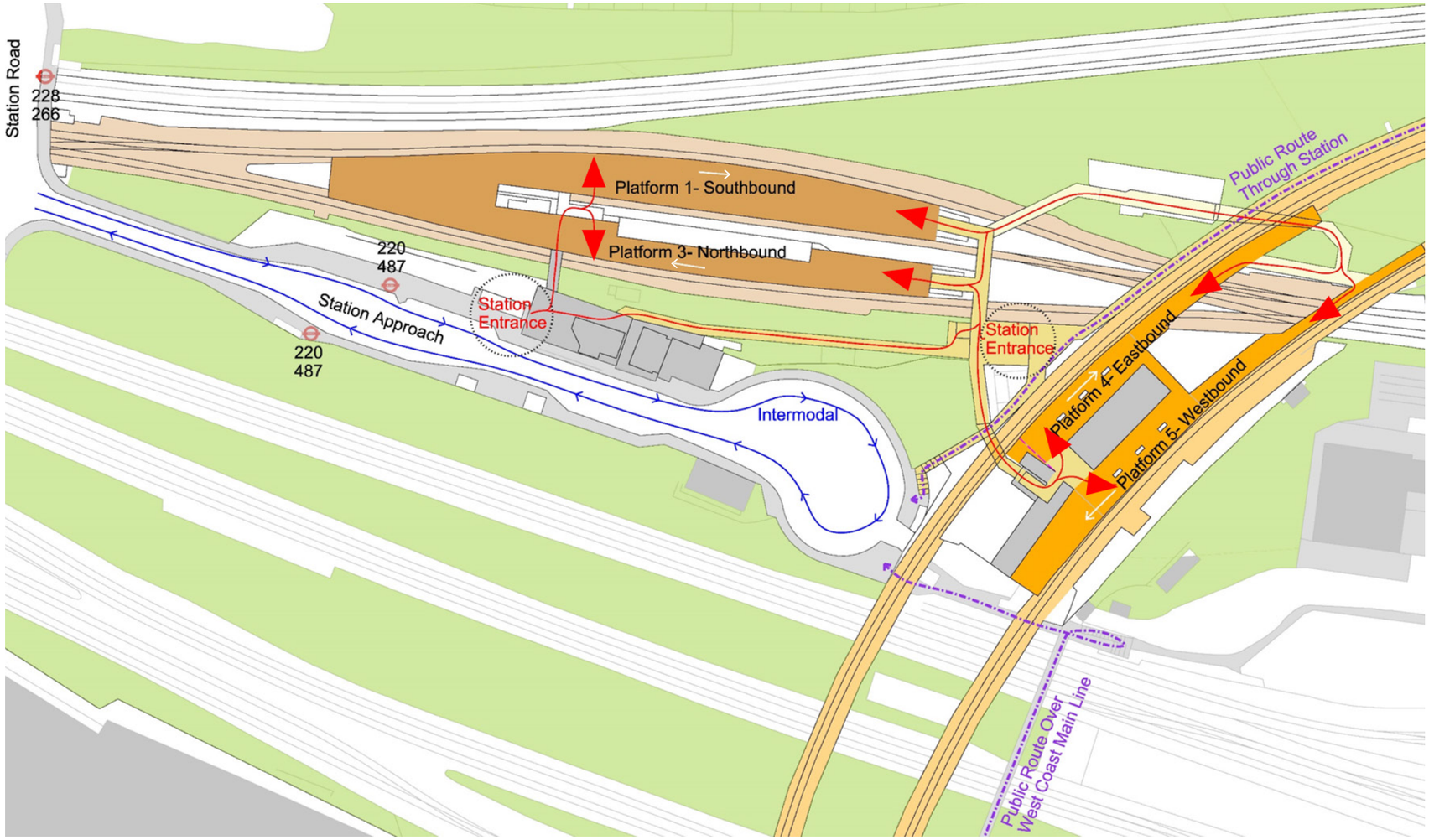
3.0 EXISTING STATION

3.0 EXISTING STATION

Over many years Willesden Junction Station has been subject to a series of upgrades which have created a number of issues that need to be addressed:

- The station has two entrances. One is located on Station Approach, while the other is located between the Low Level (LL) and High Level (HL) stations accessed from a public right of way which passes through the site. Both entrances are poorly defined, have little or no street presence and consequently are difficult to find.
- Joining the LL and HL platforms are two interchange passageways which are convoluted routes, narrow and confusing having multiple level changes and changes of direction creating very poor intuitive wayfinding.
- Only the Station Approach entrance has Step Free Access (SFA) which creates a circuitous route and long travel distances for Persons with Reduced Mobility (PRM) using HL P4/5. Lifts were added as part of an SFA station upgrade. One is located on the overbridge serving P1/2/3 the other is accessed form the underpass serving P4/5.
- Vehicular access to the site is possible only from the west via Station Approach, which also accommodates the intermodal forecourt. This is also the only route providing vehicular access to the TMD, such that maintenance traffic must first pass through the intermodal forecourt. Additionally, this route is constrained by a narrow and low underbridge as it passes underneath the North London Line (NLL) tracks that serve the HL platforms.

These issues are shown visually on the following page.



Existing Station Arrangement



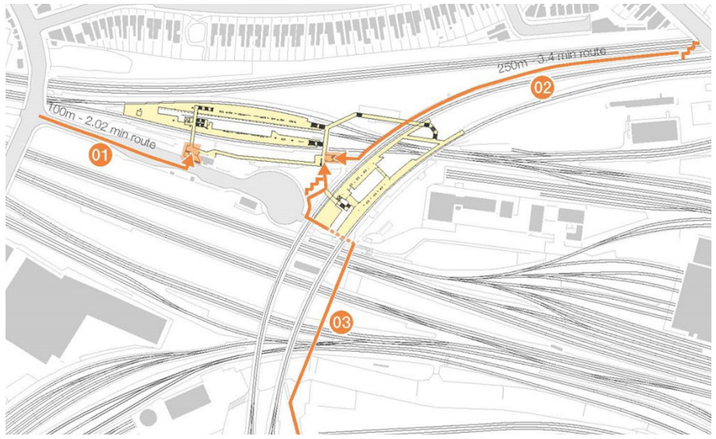
Existing Station Approach Ticket Hall



Existing Harrow Road Ticket Hall

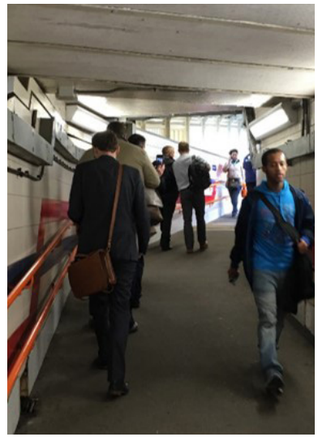
ENTRANCES

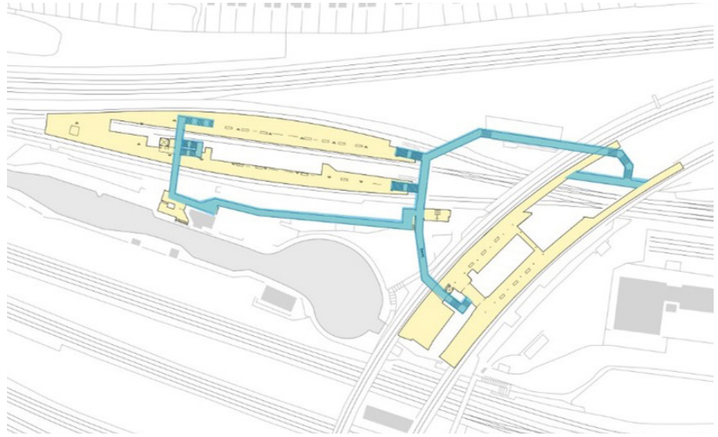




Existing route to Harrow Road Ticket Hall

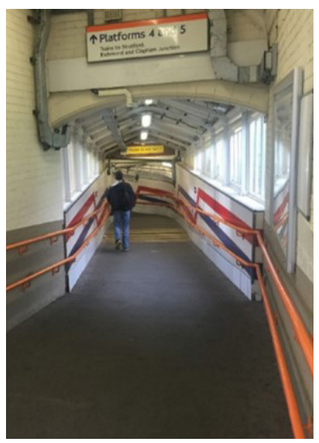
INTERCHANGE

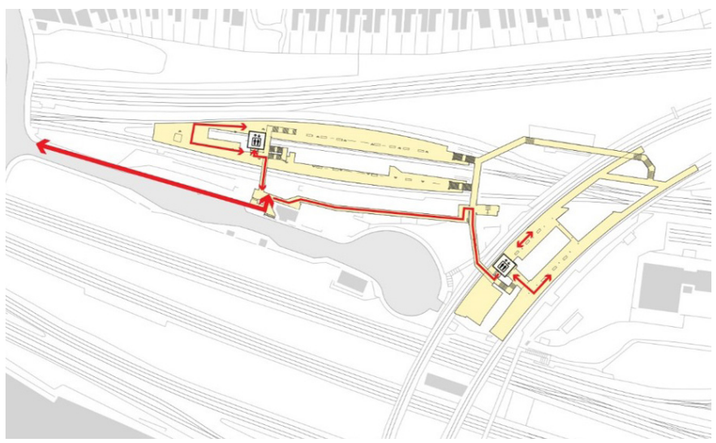




Existing interchange and access to High Level platforms

STEP FREE ROUTES

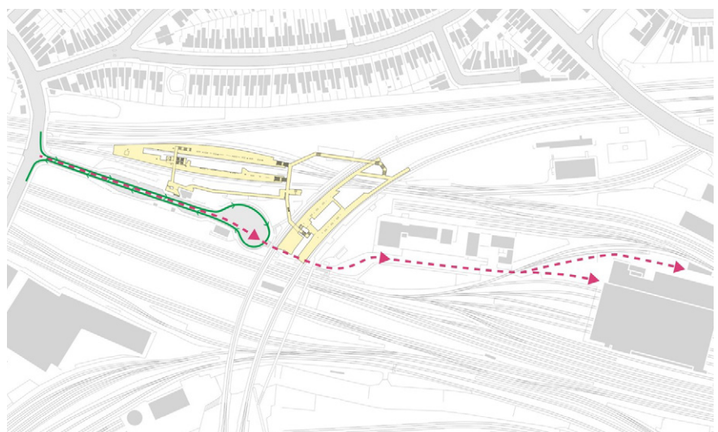




Existing Step Free Access to High Level platforms

VEHICULAR ACCESS





Existing vehicular access to depot constrained by underbridge

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4.0 CAPACITY AND DEMAND

4.0 CAPACITY AND DEMAND

4.1. PRESENT DAY STATION PERFORMANCE

Willesden Junction is a major interchange station between London Overground and London Underground (Bakerloo) services with 6.7 million passengers using the station annually. This includes all access, egress and interchange flows to and from the Overground routes and Bakerloo line. In comparison the average for Overground managed stations is 2.9 million.

After a review of the dynamic modelling base model from the previous 2010 study and on-site observations, it was noted that during peak periods the station is at capacity in some key areas and beyond capacity in others.

Examples of this could be seen during observations on P1/3, where alighting passengers seeking to interchange to P4/5 experienced significant and sustained congestion at the base of the access stairs. Additionally during the PM peak the passageways from P4/5 to P1/3 became severely congested. These areas are particularly important as they are the primary routes providing interchange for passengers.

Station staff also identified these as particular problem areas and expressed their concern for the station's current design to meet present day demand, most notably under disrupted operations.

With the proposed HS2, National Rail and Crossrail station providing new interchange opportunities and significantly improved connectivity for the area, Willesden Junction is forecast to experience a significant increase in passengers.

4.1.1. Peak Periods

Station staff identified the peak hours as 07:00-08:00 for the AM and 18:00-19:00 for the PM. This is considered a relatively early AM peak and late PM peak. For crowd management two members of staff are located on P4/5; two on P1/3; two at the main entrance/exit and one at the Harrow Road entrance/exit.

The following table summarises the platform demand during the AM and PM peaks for the station.

Platforms	AM	PM
1 – Euston/ Elephant and Castle	**Very busy**	Not busy at all
2	Special services only	Special services only
3 – Watford/ Harrow and Wealdstone	Not busy at all	**Very busy**
4 – Stratford	Medium busy	Medium busy
5 – Clapham/ Richmond	**Very busy**	**Very busy**

Both subways to P4/5 are well used with those interchanging from P1 to P4/5 in the AM primarily using the north side access. During the PM peak the south subway access on P4/5 is busier than the north, this is due to more passengers heading to the exits and most interchangers being between P3 and P4/5.

During the AM peak, the highest flow is from P1 to P5, this is followed by those going from the Entrances to P4/5 and P1.

For the PM peak the highest flows appear to be from P4/5 to P3 and the exits.

Survey data up to 2014 and reconciled to autumn 2014 RODS (Rolling Origin and Destination Survey) counts show that the PM is the busiest of the two peak periods.

4.1.2 Interchange and Entry/Exit

The current proportion of interchange to station entry/exit from RODS 2014 data is as follows:

AM Peak - 51.3% Interchange, 48.7% Entry/Exit
PM Peak - 57.4% Interchange, 42.6% Entry/Exit.

4.1.3. Use of Entrance/Exits

The RODS data provided by TfL indicates that the split between entrances currently is approximately:

- 60% to the West exit to Station Approach
- 40% to the East exit (heading towards Harrow Road)

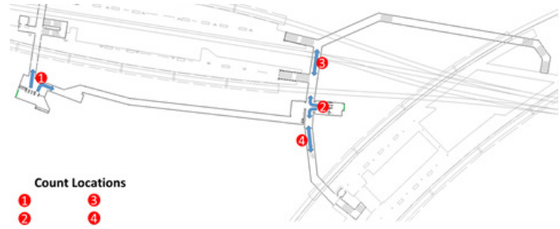
4.1.4. Previous Studies

A previous dynamic assessment in 2010 of the station pedestrian flows highlighted concerns with regards to gate-line capacity not able to cope with future demand. It also showed that in the future, high levels of density are likely on P1/3 in 2026 in the current configuration. This could be alleviated by increasing the frequency and size of the trains on the Watford DC/Bakerloo Line. At the time of the study it was suggested that the size of P1 permits passengers waiting for the stairs to queue was at a relatively acceptable Level of Service (LOS), however by 2026 passengers would need to queue for an extended duration before being able to depart the platform area.

4.1.5. Spot Check Survey

The design team undertook spot checks on the AM and PM peak during June 2016 to increase confidence in the provided 2014 RODS data.

The following diagram shows the count locations for the spot survey.



- Locations 1 and 2 – Count individual entry flows to P1/3 and P4/5
- Location 3 – Count alighters from P1 (AM peak) and P3 (PM peak)
- Location 4 – Count P4/5 South Stair Access Boarders and Alighters

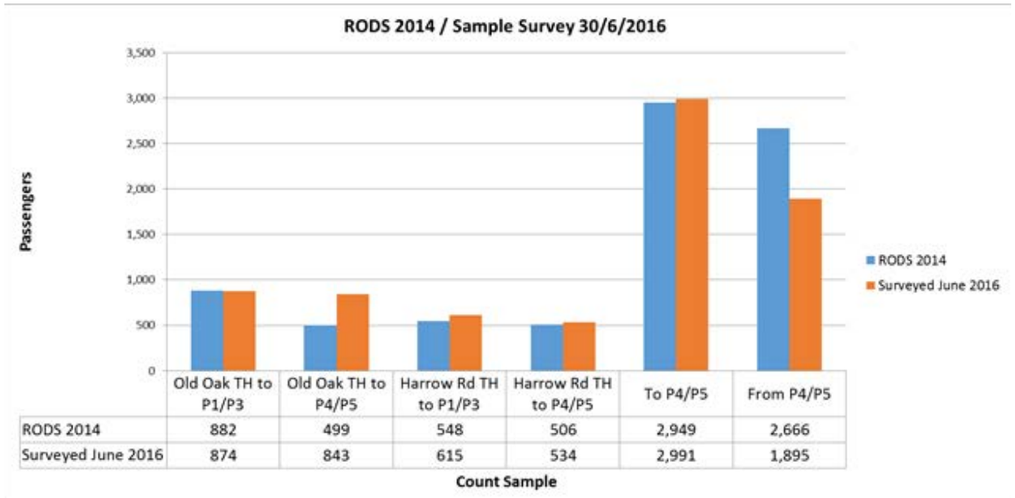
This survey indicated good alignment with the RODS data. This ensured that the baseline condition was acceptable for developing future scenarios.

However, in terms of station performance it was noted that the existing station has a number of non-compliance issues:

- Passenger circulation widths do not comply with Station Planning Guidelines.
- Stair and lift run offs are non-compliant.
- Interchange routes are convoluted creating poor wayfinding and poor passenger experience.
- Harrow Road entrance does not provide SFA. These issues can only be addressed with building interventions.

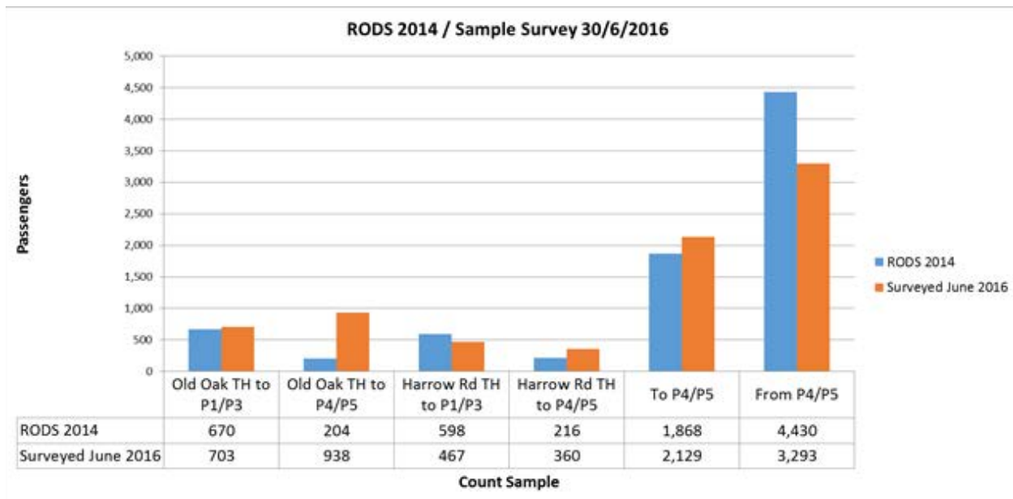
From site visits, and from discussion with Station Staff, it was clear that service disruptions create the greatest stress on station operation as there are few areas where waiting can be accommodated in the event of service disruptions. Additionally, from on-site observations it was evident that during normal operation the station is at capacity and the demand is expected to soon exceed this. These observations were supported by station staff.

Morning Peak, 07:00-10:00



	Old Oak TH to P1/P3	Old Oak TH to P4/P5	Harrow Rd TH to P1/P3	Harrow Rd TH to P4/P5	To P4/P5	From P4/P5
RODS 2014	882	499	548	506	2,949	2,666
Surveyed June 2016	874	843	615	534	2,991	1,895

Evening Peak, 16:00-19:00



	Old Oak TH to P1/P3	Old Oak TH to P4/P5	Harrow Rd TH to P1/P3	Harrow Rd TH to P4/P5	To P4/P5	From P4/P5
RODS 2014	670	204	598	216	1,868	4,430
Surveyed June 2016	703	938	467	360	2,129	3,293

4.1.6. Design considerations for station improvements

The following observations on current station performance were used to inform generation of the station option proposals.

Issue	Comment	Recommendation
Passenger types / Behaviour	• Willesden Junction serves commuter passengers today. • In the future passenger types using Willesden Junction may diversify in light of regeneration to potentially include leisure travellers and a higher proportion of passengers carrying luggage. • Passenger surges observed at the station, principally alighting passengers interchanging. More prevalent to surges during PM peak period.	• Consider widening passageways for interchange movements. • Consider consolidating passageways to simplify station use for passengers
Concourse sizing	• In the future, likely to operate differently to today's operation. Likely to be meeting points potentially for travel onwards via HS2. • Ticket hall area should provide sheltered accommodation in the event of a service disruption.	• Consider consolidating ticket halls if design permits. • Increase unpaid side of the ticket hall areas
Passageway sizing	• In the future, passenger types may carry more luggage due to possible change in passenger types. • Increase in future train lengths is likely to produce higher surges of passengers.	• Widen passageways where possible in particular for access between lifts
Platforms	• Should not be reduced in size. • For delayed operation likely to be heavily used	• Maintain present size until tested using dynamic modelling to accurately incorporate alighting surge
Escalator installation	• Where there is a height differential between 3m - 5m: Consider escalator installation (LU SPSG). • Where there is a height differential above 5m – Escalator or Lifts (LU SPSG).	• Consider installation of escalators / Lifts
PRM	• Insufficient space for wheelchairs / buggies / large luggage to pass in corridor between Harrow Rd TH and P4/5 passageway.	• Widen passageways where possible.

4.2. RAILPLAN FORECASTS

Railplan forecast data was provided to determine future demand. A 2011 reference case was given for both the AM and PM peak, following this, several demand data sets for future years 2026 and 2041 were provided with varying scenarios, which included:

- Equivalent of the reference case but with Planet (HS2 modelling) demand replacing long distance rail demand
- With HS2 Phase 1 (no Overground stations, no OPDC demand)
- With HS2 Phase 1 plus the Overground stations, but no OPDC demand
- With HS2 Phase 1 plus the Overground stations and some OPDC demand – Year 2026 only
- With HS2 Phase 1 plus the Overground stations and OPDC demand – Year 2041 only

Railplan data for the AM peak comprised of all these scenarios, however the PM peak data only included the first two scenarios listed – the equivalent year reference case and with HS2 phase 1 (no Overground stations, no OPDC demand).

A comparison of the Railplan data with the previously validated RODS 2014 dataset indicated that the estimated demand from the Railplan data is significantly lower than expected. Furthermore, the Railplan dataset is primarily used as a source for high-level strategic use and is not intended to provide an indication of flows within a particular station.

To resolve this issue it was decided, with client approval, that a derivation process would be used to revise the demand figures using RODS 2014 data as a base reference case and to determine flows within the station.

A comparison between the Railplan 2011 base and the corresponding scenarios for each peak was made. This used an uplift percentage between these datasets for each line serving the station as well as access/egress. These uplift percentages were applied to the RODS 2014 data to create a derived Origin/Destination matrix.

Railplan Data Scenarios	2011	2026				2041				
Basecase/"Do minimum"	✓	✓				✓				
HS2 Phase 1			✓	✓	✓		✓	✓	✓	✓
Overground stations at Old Oak Lane and Hythe Road				✓	✓			✓	✓	✗
OPDC development					✓ (part)				✓ (full)	✓ (full)
WLL/NLL train assumption		5 car, 378 stock		6 car, 378 stock		5 car, 378 stock		8 car, 378 stock		
WLL/NLL train frequency		4+4 tph		6+4 tph		4+4 tph		6+4 tph		

4.3 FUTURE USE OF ENTRANCES/EXITS

The current station split of entrance use is approximately 60% to the west and 40% to the east (59.9% to A4000/Old Oak Common Lane, 40.1% toward A404/Scrubs Lane). For pedestrian modelling, in the 2041 condition, the study makes the assumptions that walking is split equally between entrances and that for all other transport modes 80% use the intermodal forecourt and 20% use the entrance remote from the forecourt. Considering the potential future intermodal journey distribution, this results in a future station entrance split of 70% towards the intermodal forecourt and 30% to the "other" entrance, which is adopted for Legion modelling.

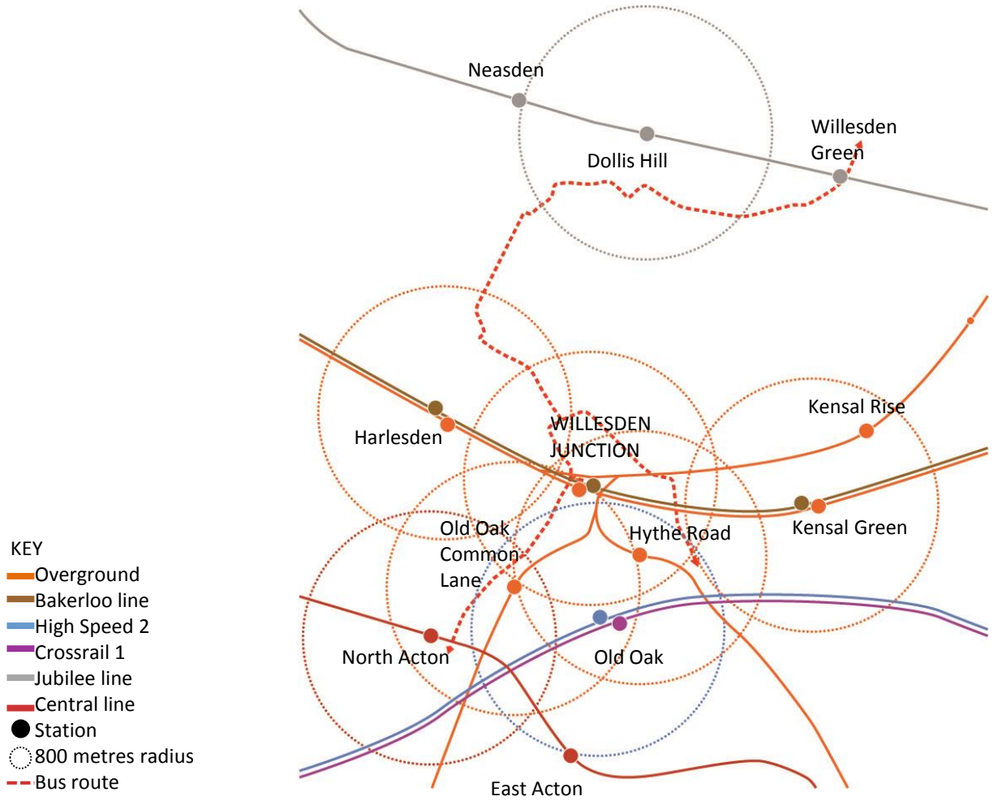
Analysis provided by TfL Urban Design (August 2016) identified the likely catchment area for Willesden Junction, in the context of the current and proposed stations. The analysis is based upon using an 800 m walking catchment for each station to represent a 12 minute walk, as passengers from further away are likely to take a bus.

The diagram opposite plots the 800 m radius from each station and the bus routes currently in the area. This assists in defining the catchment area advised by TfL for Willesden Junction, which extends over 800 m to the north due to the distance between Dollis Hill and Willesden Junction, while it is less than 800 m on the east and west side due to the proximity of Harlesden and Kensal Green.

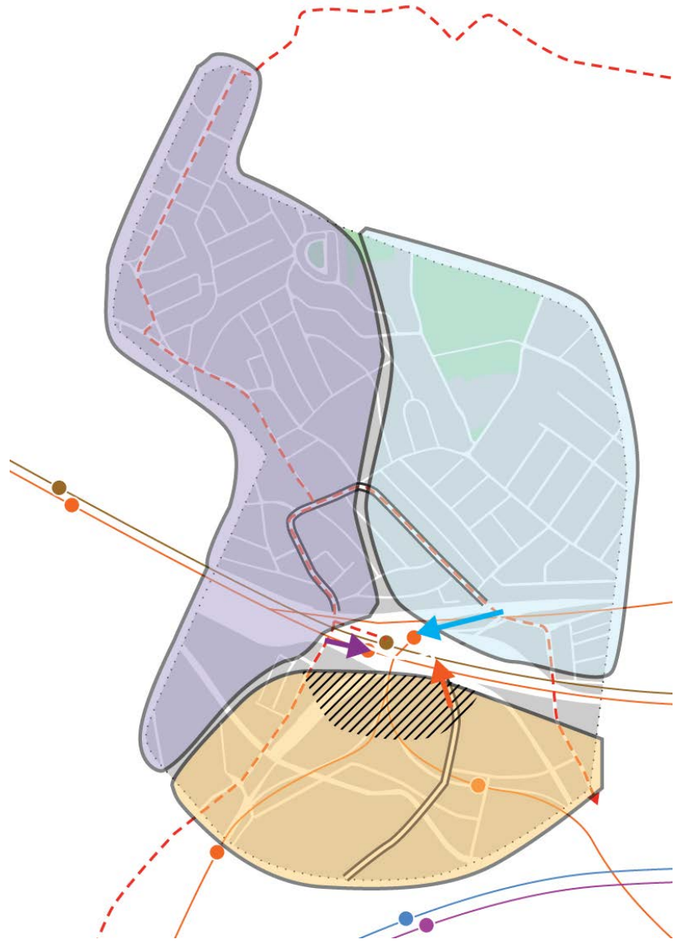
The resulting catchment area has a northern part which is mainly low density residential (with the primary exception of Roundwood Park and the High Street). The southern part is characterised by the new mixed use proposed development surrounded by industrial land.

As the diagram indicates, TfL's qualitative analysis suggests a relatively even spread of people accessing the site from all directions with flow to the station entrances from three main directions:

- From the south to land that will be developed under the OPDC.
- From the west along Station Approach and linking to Old Oak Lane
- From the east along the footway to Harrow Road.



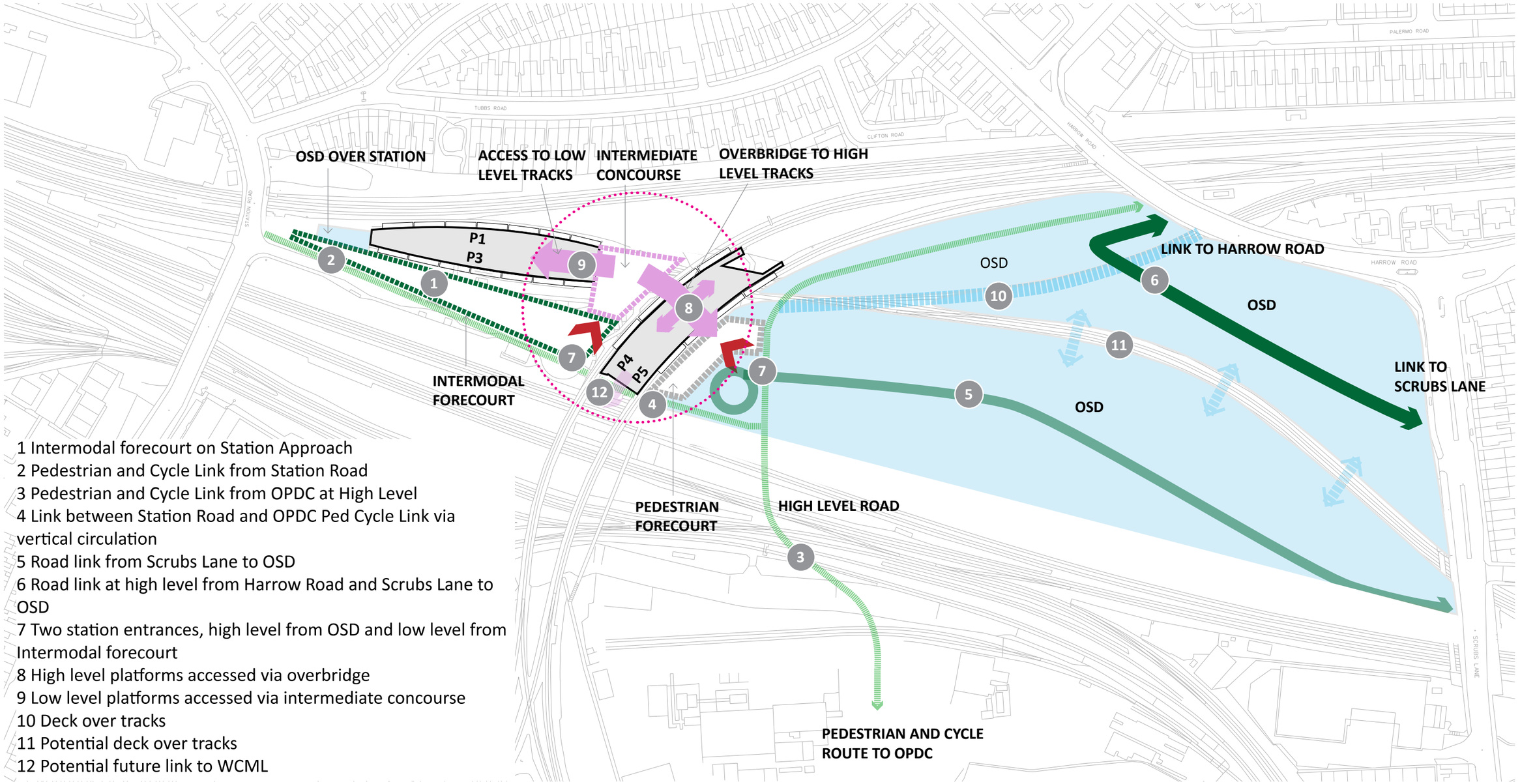
Catchment area



Flows to station entrances

5.0 OPTION 1 - CENTRAL OPTION

CENTRAL OPTION



1 Intermodal forecourt on Station Approach
2 Pedestrian and Cycle Link from Station Road
3 Pedestrian and Cycle Link from OPDC at High Level
4 Link between Station Road and OPDC Ped Cycle Link via vertical circulation
5 Road link from Scrubs Lane to OSD
6 Road link at high level from Harrow Road and Scrubs Lane to OSD
7 Two station entrances, high level from OSD and low level from Intermodal forecourt
8 High level platforms accessed via overbridge
9 Low level platforms accessed via intermediate concourse
10 Deck over tracks
11 Potential deck over tracks
12 Potential future link to WCML

OSD SITES
PEDESTRIAN AND CYCLE LINKS
VEHICULAR LINKS
STATION ENTRANCE

5.0 CENTRAL OPTION

5.1 DESCRIPTION OF SCHEME

The Central Option places the station concourse centrally between the LL and HL Platforms.

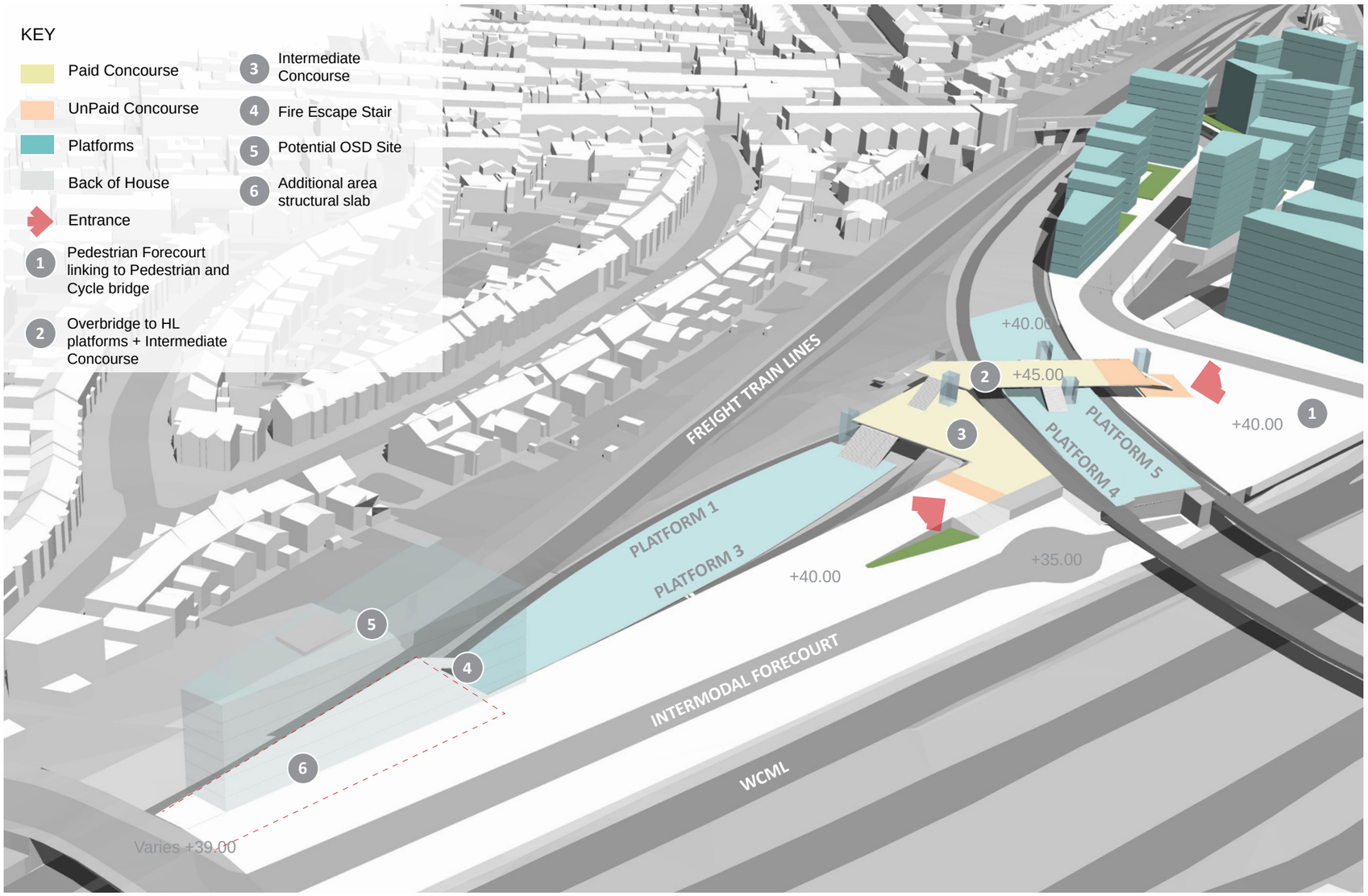
The intermodal forecourt remains in its current location on Station Approach and is increased in size to provide additional capacity.

An entrance is provided in the same position as the existing entrance at the end of Station Approach to serve the intermodal forecourt and pedestrians to the east. Lifts and stairs provide access from the station concourse to the LL platforms and via overbridge to HL platforms.

On the east side of the station is a new entrance, pedestrian forecourt and cycle bridge across the WCML providing north-south connectivity and permeability across the site connecting Willesden Junction with OPDC development and potentially Hythe Road station. East-west connectivity is provided via stairs and cycle ramp from bridge level to grade and through the existing underpass to Station Approach.

It is assumed that in 2041 the existing TMD will have been relocated and P2, which is linked to the TMD, can be removed to create a larger island platform. Platform operational areas have also been consolidated into a central support accommodation area, freeing up waiting areas on the platforms during perturbed scenarios.

It is proposed that OSD be built at grade on the TMD site and on partial podium deck on the sites which front onto Harrow Road and Scrubs Lane. There is limited potential for OSD in Station Approach due to intermodal forecourt space requirements.



5.2. RAIL OPERATIONS

The central station option places all gate lines and station access around a central core area. The two station entrances are in close proximity to each other with well-placed station accommodation. The gate line and station access placement allow station staff to move easily between critical locations, with dual entrances allowing for effective evacuation.

The Central Option replicates current operating arrangement and facilities. The current provision of 70sqm may not accommodate any growth in train crew numbers due to future enhanced service frequency. Although the station accommodation is well placed, it is split across two levels. However, the accommodation is placed in or around the bridge over P4/5, therefore in easy reach of P1/3. There are no direct implications on train crew operations specific to each of the three options.

Should platforms be reinstated on the slow lines of the WCML, passive provisions have been made to connect to these. Consideration has been given to locating a future Up Slow Line platform opposite a future Down Slow Line platform to improve accessibility and connectivity between all station platforms. However, the location of the existing pedestrian/cycle link running alongside the WCML complicates access to/from any future Slow Line platforms, unless the main access is provided via a bridge between the piers of the NLL viaduct to the south of P4 and P5. The fact that the main interchange facility is set in the northeast corner, and hence far from WCML platforms, could also prove problematic, while connections to Slow Line platforms would be lengthy and likely require additional entrance facilities.

5.3. STATIONS OPERATIONS

5.3.1. Station Management

The central concourse and consolidated support accommodation reduce walking distances to all areas of the station making it easier for staff to manage the station.

The aforementioned improvements in usable platform areas provide passenger waiting areas for the perturbed scenarios.

Separate routes into the HL and LL platform areas will provide operational flexibility to manage passenger flows independently and close off access if there is an operational incident.

5.3.2. Wayfinding

Passenger routes from the centrally located concourse to the platforms are intuitive and easy for passengers to navigate. (LL Platform - one level change and two changes in direction, HL Platforms - two level changes and three changes in direction). Interchange passenger routes are simple and direct through the centre of the station.

5.3.3. Step Free Access

Accessible lifts are provided at both station entrances and PRM travel distances are relatively short. However, due to the intermediate concourse, interchanging between the LL and HL platforms would require three lifts, as opposed to just two in the Dual Option described in the next Section.

5.4. FIRE AND EMERGENCY MANAGEMENT

5.4.1. Means of Escape

5.4.1.1. Platforms 1 and 3

Egress from the east of the proposed P1/3 will be via the stairs leading to the proposed new concourse, with an additional egress to the west of this platform via stairs to a proposed public square.

With the two proposed exit routes being on opposite ends of this platform, there is little more than 10m from the extremities of these platforms to the platform exits. As such, this platform does not present any significant dead-ends, which are not permitted when following the guidance of RSPG(Railway Safety Principles and Guidance).

This platform length is approximately 130m, with the distance between exits being approximately 110m. Following the guidance of RSPG, exits should be positioned “with a travel distance of not more than 90m between any two exits”. Despite this distance being exceeded by approximately 20m, it is expected that this will be deemed acceptable by the regulators as this platform is in open air and there are no dead-end conditions.

The proposed exits will be assessed at a later design stage to ensure that they provide sufficient width to allow all occupants to clear the platforms and station building within the recommendations set out in the Network Rail Station Capacity Assessment Guidance.

5.4.1.2. Platforms 4 and 5

Egress from the north and centre of the proposed P4/5 will be via stairs leading to the proposed new overbridge, with an additional egress to the south of this platform via stairs and an enclosed corridor to an intermodal forecourt on the station approach.

With the three proposed exits routes, two on opposite ends of this platform, there is little more than 20m from the extremities of these platform to the platform exits. As such, this platform does not present any significant dead-ends, which are not permitted when following the guidance of RSPG.

Following the guidance of RSPG, exits should be positioned “with a travel distance of not more than 90m between any two exits”. This platform length is approximately 110m, with the distance between exits being no greater than 40m. As such, this recommendation of RSPG is addressed.

The proposed exits will be assessed at a later design stage to ensure that they provide sufficient width to allow all occupants to clear the platforms and station building within the recommendations set out in the Network Rail Station Capacity Assessment Guidance.

5.4.2. Egress for Persons of Reduced Mobility

The exit to the east of P1 and P3 to the new concourse will be step free, via a lift, for the evacuation of PRM. This lift will be required to be configured as an evacuation lift. In the current design there is no provision of step free egress to the west of this platform. A plan should be put in place to ensure there is a procedure for the evacuation of PRM occupants from this end of the platform.

The exits to the north and the centre of P4/5 to the new overbridge will be step free, via lifts, for the evacuation of PRM. These lifts will be required to be configured as evacuation lifts. In the current design there is no provision of step free egress to the south of this platform. A plan should be put in place to ensure there is a procedure for the evacuation of PRM occupants from this end of the platform.

The options for the evacuation of PRM occupants include:

- providing, where practicable, step free escape routes directly to a place of safety.
- Providing lifts, configured as evacuation lifts.
- Use of evacuation chairs and/or powered stair climbers.

5.4.3. Fire-Fighter Access

With fire-fighter access to both platforms coming via Station Approach. There is good access to the proposed concourse, the entire length of P1/3 and the south of P4/5. It should, however, be discussed with the relevant fire authority whether additional fire-fighter appliance access will be required to serve the platforms. A turning facility should be provided along the Station Approach to ensure that any fire appliance will not be required to reverse for a distance greater than 20m.

5.4.4. Fire-Fighting Equipment (Fixed and Portable)

It is assumed that no dry mains are provided along the existing platforms and that dry mains will not be required for the proposed new platforms. This should be confirmed with the relevant fire authority. It should be ensured that access to a fire hydrant is available within 90m from the entrance to the station building.

The type and location of portable fire-fighting equipment should be determined by means of a fire risk assessment and should be in accordance with BS 5306 Part 8.

5.4.5. Fire Detection and Alarm

RSPG: 2-B recommends that an electrical fire alarm should be provided which is capable of manual operation by the public or staff. To comply with this, the station building will be provided throughout with a manual alarm system. This will include the provision of manual call points on the platforms.

A survey of the existing station building will be required in order to determine the current fire detection and alarm provision and to establish how this will be interfaced with the proposed system.

Automatic fire detection will be provided in all lift shafts.

5.4.6. Fire Suppression Systems

Suppression systems for life safety purposes are not required in the Building Regulations, however RSPG 2-B does recommend the use of suppression systems in machine and plant rooms. There may be potential to omit this requirement for the use of suppression systems as Willesden Junction Station is a surface station and the plant rooms will provide minimal risk to life safety. This will be required to be discussed with and agreed by all relevant stakeholders.

5.4.7. Fire Ventilation and Pressurisation Systems

As the proposed new platforms are in the open air, there is no requirement for any ventilation or pressurisation.

5.4.8. Fire Separation, Compartmentation and Structural Fire Protection

Any accommodation on the proposed new platforms will be provided with smoke containment in the form of compartmentation in compliance with RSPG 2-B.

Structural fire resistance will follow the prescriptive guidance of Approved Document B.

5.4.9. Control of the Reaction-to-Fire Properties of Materials

The presence of combustible materials on the proposed new platforms will be limited to ensure that any outbreak of fire will be unlikely to develop to a significant size.

5.4.10. Fire Safety Signage

Fire safety signage will be provided throughout to comply with BS 5499.

5.4.11. Emergency Lighting

Emergency lighting will be provided to the stairs, PRM lift and along all escape routes in compliance with BS 5266.

5.4.12. Conclusion

- Neither of the two platforms in this option present any significant dead-ends, which are not permitted when following the guidance of RSPG.
- Despite the recommended maximum distance of 90m between exits being exceeded by approximately 20m on P1/3, it is expected that this will be deemed acceptable by the regulators as this platform is in open air and there are no dead-end conditions.
- There is no provision of step free egress from the west of P1/3 or the south of P4/5.
- Station Approach provides road access for fire engines and turning space at the end. There is direct access to the central concourse area from where the fire services can carry out effective fire operations.
- Firefighter intervention and means of escape are provided to both ends of LL platform and via overbridge and stairs to the HL platforms.

On completion of the proposed works, the new platforms will be compliant with the guidance set out in Approved Document B 2010 edition, the Railway Safety Principles and Guidance and the British Standards.

5.5. URBAN REALM AND PLACE MAKING

5.5.1. Option Overview

This option for the redevelopment of the station would be accessed from two new entrances, one on the west side and a second new entrance on the eastern side. The two entrances would take passengers into a new ticket hall area, which would then have an elevated corridor bridging over P4/5 to serve the new eastern entrance.

The existing interchange for buses and vehicles would remain on Station Approach, with some enhancement of planting. A new forecourt to serve local drop-off and cycling would also be created on the eastern side. A second entrance and ticket gateline is provided on this eastern side, but all other station facilities will be located in the combined intermediate concourse and ticket hall between both sets of platforms.

5.5.2 Urban Realm and Place Making Impacts

5.5.2.1. Efficiency

This option would have a similar level of interchange efficiency as the existing bus and car drop-off facilities would remain in their current locations, with an additional local drop off option provided on the east side. Access to all platforms would be via the central ticket hall and intermediate concourse. The new eastern entrance would be a significant improvement on the existing facilities for those approaching from the east, particularly if the bus stops for the 18 and 220 bus routes are moved closer to the new forecourt area, rather than at the end of the narrow path on Harrow Road.

5.5.2.2. Legibility

The station would be more legible for those moving around within it, as routes will be more direct and less convoluted. Likewise, the new entrance on the east side will provide a visual marker for the station, greatly improving legibility for those approaching from this direction. However, for those approaching from the west, there is a risk that legibility may be decreased as the station entrance will be moved further along Station Approach away from the main road (Old Oak Lane / Station Road). While signage can be provided, there will be limited visibility of the station building until you are onto Station Approach. This will largely depend on the ultimate design of the OSD, which will have a significant impact on the appearance from this direction. However, the more intuitive wayfinding of the combined entrance, ticket hall and central interchange on the west will be an improvement over the fragmented existing arrangement.

5.5.2.3. Permeability

In this option there will be an east-west route provided for cyclists and pedestrians using the existing low level vehicle access from Station Approach. Significant improvements are required to improve the ambience of this link below the NLL viaduct. This route is then linked up to the new pedestrian forecourt via a new ramp and has further links across the WCML via a new combined pedestrian and cycle bridge. This will provide an unpaid route with improved permeability over the existing situation, which currently has only stepped access up to a footbridge with no cycle link.

There will then be two new entrances provided to the station which makes it less permeable that the current station in terms of access points, but the legibility of these will be improved so wayfinding will be improved as a whole. The internal movement routes do not lend themselves to an unpaid internal route. There is potential scope for an additional entrance at the western end of P1/3, but this would have operational impacts and requires additional study.

5.5.2.4. Sense of Place

While the station will be condensed into a central interchange concourse, the sense of place is limited by the lack of street frontage and presence on the major adjacent roads, particularly on the west side. The new forecourt to the east provides an opportunity for a landmark public space to be integrated with additional development. There is an opportunity to generate a space which is recognisable as the station and which creates a sense of place for travellers and visitors to the station.

5.5.2.5. Townscape

The new forecourt and entrance on the east provide an opportunity to deliver a strong piece of new townscape which integrates active frontages, mixed uses and activates a vibrant street scape. The station entrance can be a focus within this, easily recognisable and legible. While Harrow Road is currently the main street frontage, the opportunities here for OSD mean that a new area of townscape can be created for the station to sit within. On the west side, this will be more difficult as the entrance is at the end of Station Approach and the existing townscape along Old Oak Lane / Station Road will not be enhanced or have much scope for enhancement. There are also more limited opportunities for OSD on this western side, so any potential benefits of providing a new and enhanced townscape through development are also limited.

5.5.2.6. Accessibility

The new entrances would both provide step-free access to the station. However, while the pedestrian route from Station Road on the western side will be level, the intermodal forecourt turning area and unpaid east-west cycle and pedestrian link must slope down steeply in order to pass under the existing bridge.

The station would still be over split levels and while lifts or escalators can be provided, it is still likely to be complicated for the disabled, elderly and families with young children or luggage. The unpaid link under the tracks between east and west sides negotiates a significant change in level. A ramp is envisaged to tackle this height difference, the arrangement of which will be developed at the next design stage.

5.5.2.7. Community

The opportunities to enhance a sense of community through this station option are more obvious on the eastern side where the new forecourt could provide a space for events or markets etc. The interchange area on the west and slope of Station Approach limits its usability. As a whole, the option is an improvement over the existing situation as bus access will be better and the environment around the interchange will be enhanced through planting, making it a more pleasant area for people to use.

5.5.2.8. Economy

This option provides some opportunities for OSD and development, but by retaining Station Approach as the primary area for interchange, it is limited on the west. There are significant areas to the east and these are common to all options. In particular, the potential for activating the station forecourt are to be explored further, as there is plenty of room for commercial uses which could be used to activate the streets and frontages.

5.5.3. Conclusion

This option brings multiple benefits over the existing station, but many of these are common to all of the options. Features specific to this option are less advantageous in some cases, such as the entrance being more remote and less visible from the main roads to the west. The retention of the interchange facilities on the west mean less disruption to connections with onward intermodal travel. However, it will likely cause disruption to station use during construction. It also means that some of the disadvantages of this interchange, such as the level changes, will remain.

Looking to the longer term, although possible, it will be more difficult for this option to be upgraded to provide access to WCML platforms should they be added here in the future.

There is also limited scope to deliver jobs and homes as part of the station development, particularly on the west side of the station.

In summary:

- Western side essentially provides a basic enhancement over the existing situation. Opportunities exist for enhanced planting and improved street environment, which would need to be balanced against development opportunities.
- Minimal disruption to existing public transport services, as the current layout is retained.
- Opportunities to include improved cycle links and increased cycle parking.
- New station forecourt to east would provide better integration with future development on eastern side of the station.

5.6. TRANSPORT PLANNING

With the Central Option, the proposed Station Approach entrance to the station would be slightly further from the existing passenger catchment to the north in Harlesden than the current entrance, but it would face the interchange facilities on Station Approach. This would mean that people exiting the station should be able to easily locate the interchange facilities. The proposed additional station entrance to the southeast of the North London Line would be convenient for access by non-motorised users within the future catchment created by the proposed OSD immediately to the east and the OPDC to the south via the proposed foot/cycle bridge over the WCML.

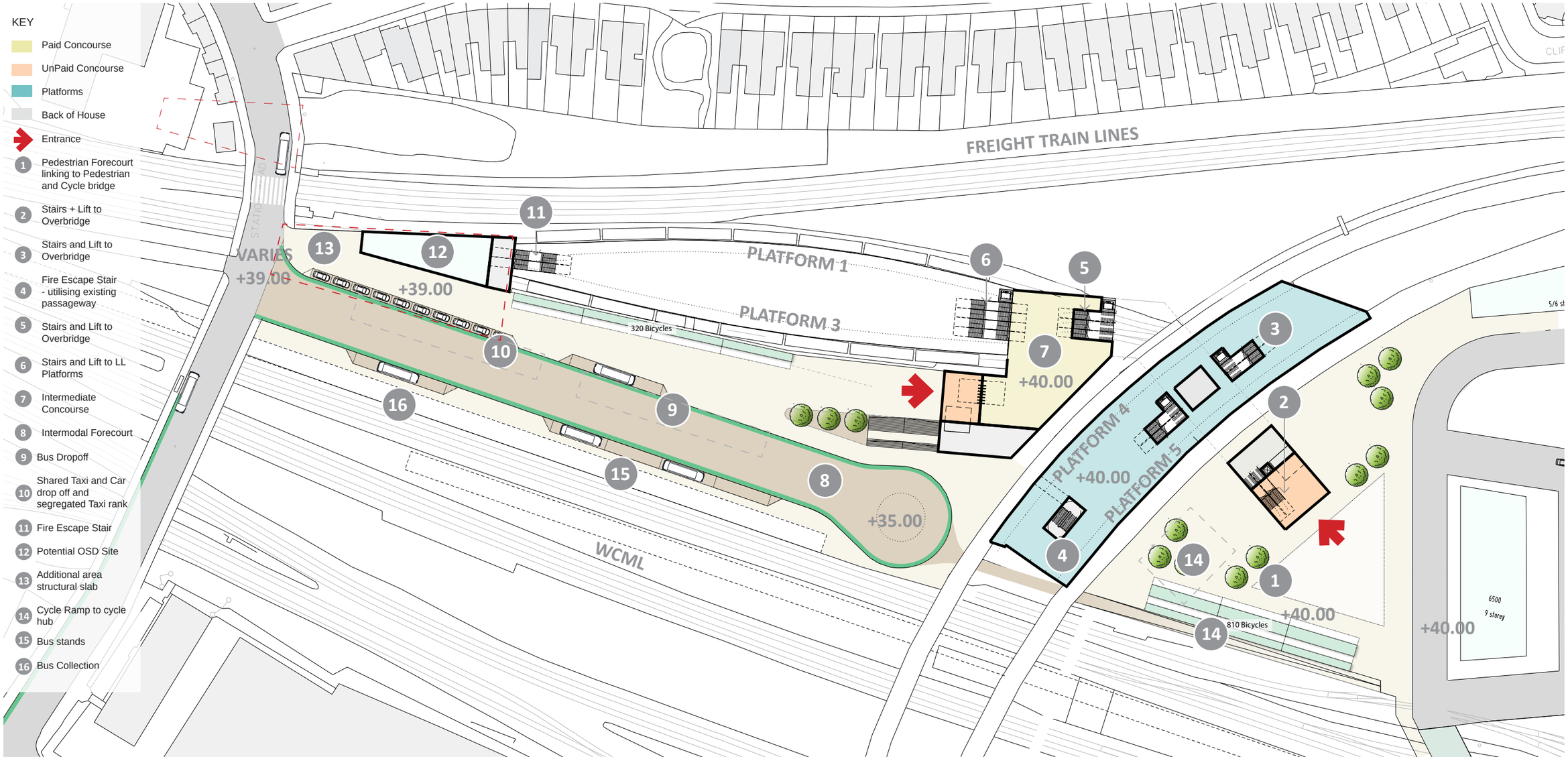
However, this option does not offer the opportunity for future bus routes connecting the OPDC to the south with Station Approach/ Old Oak Lane and Harrow Road via Willesden Junction Station, since no vehicular bridge is proposed over the WCML to the south. This is likely to limit accessibility to the station by bus to and from the OPDC to the south, which may dampen future passenger demand. It also means that connectivity between the OPDC and Harlesden to the north would remain relatively poor, although the proposed foot/cycle bridge over the WCML would improve connectivity for non-motorised users.

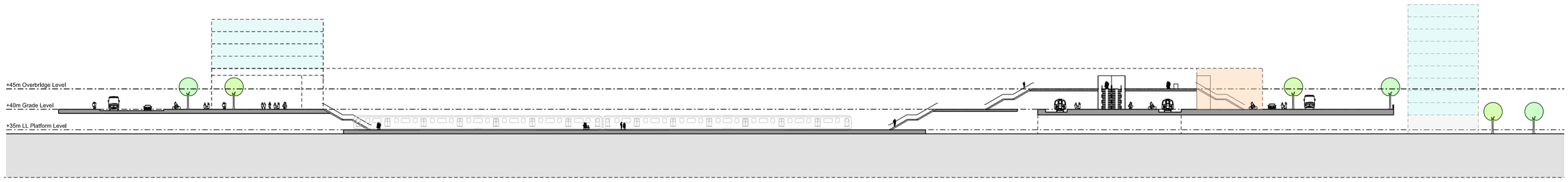
- Intermodal interchange on western side of station between Station Road and ‘western’ station entrance.
- Pedestrian and cycle link from Station Road to the west, the High Street to the north east, Scrubs Lane to the east and the OPDC development to south via new foot/cycle bridge over WCML.
- Unpaid pedestrian and cycle links through station provide east-west connectivity via NLL underbridge and vertical circulation up to pedestrian forecourt.
- Road links from Scrubs Lane and Harrow Road to OSD to east of station.
- Two station entrances - at grade from Station Road and high level eastern pedestrian forecourt.
- Less opportunity to connect to future bus routes from OPDC development in the south.
- Connectivity between OPDC and Harlesden remains poor for vehicles.
- Space for locating enhanced intermodal facilities on Station Approach is limited.
- Number and position of ticket gates shown opposite is indicative; gates in eastern entrance could be positioned at forecourt or bridge level.

N

KEY

- Paid Concourse
- UnPaid Concourse
- Platforms
- Back of House
- Entrance
- 1 Pedestrian Forecourt linking to Pedestrian and Cycle bridge
- 2 Stairs + Lift to Overbridge
- 3 Stairs and Lift to Overbridge
- 4 Fire Escape Stair - utilising existing passageway
- 5 Stairs and Lift to Overbridge
- 6 Stairs and Lift to LL Platforms
- 7 Intermediate Concourse
- 8 Intermodal Forecourt
- 9 Bus Dropoff
- 10 Shared Taxi and Car drop off and segregated Taxi rank
- 11 Fire Escape Stair
- 12 Potential OSD Site
- 13 Additional area structural slab
- 14 Cycle Ramp to cycle hub
- 15 Bus stands
- 16 Bus Collection





5.7. STATION PERFORMANCE – DYNAMIC PASSENGER ANALYSIS

Legion model results are focused on the peak 15 minute periods during the AM and PM peak periods. The results show Cumulative Mean Density (CMD) and Cumulative High Density (CHD) maps and relate to the (average and high) density or Level of Service (LOS) of an area during a specific period of time (based on Fruin's level of service for walkways).

For the purpose of this exercise and as per TfL/NR standards, LOS C (1.3m² per passenger) or below is seen as desired for walkways. A Cumulative High Density map displays the duration of time spent above a LOS C. The colour ranges correspond to the time thresholds with passenger density measured above LOS C.

Dynamic modelling of the existing station layout with future demand was not conducted as static modelling was used to provide a basis for the future designs. Once a preferred design was selected this could then be optimised for pedestrian movement from the evaluation of the dynamic modelling results.

The Railplan demand data used a demand scenario with 8-car NLL/WLL services (on P4/5). As the current design cannot accommodate trains of this length this demand was applied to a 5-car infrastructure, providing a worst case scenario. Demand operational approaches requires further development in GRIP Stage 5.

As noted in Section 5.5, 70% of future entry and exit is assumed to head towards the intermodal forecourt, i.e. for this option to the west (Old Oak Lane/Station Approach).

5.7.1. AM Results

Platforms 1 and 3 and Old Oak Ticket Hall/Concourse

Figure 8.7.1 shows the CMD Map for P1/3, Old Oak Entrance and the concourse area for the 15 minute peak. P1 shows the most congestion at LOS C/D, P3 suffers minor congestion at B/C. Based on this it is evident the platforms are therefore able to cope with the peak demand during the AM. Similarly the stairs, concourse and Old Oak entrance are at acceptable levels of service with sufficient vertical circulation provided. The gateline at Old Oak provides sufficient capacity for the entry/exit demand.

Figure 8.7.2 shows the CHD Map for P1/3, Old Oak Entrance and the concourse area for the 15 minute peak. During this time, P1 shows sustained congestion (above LOS C) up to 5 minutes. The remaining areas experience LOS C for up to 2.5 minutes. The concourse and vertical circulation are subject to only brief times of congestion (above LOS C), due to the high boarding, demand on P1 is more congested than P3 for this period.

Platforms 4 and 5, Overbridge and Harrow Road Ticket Hall

Figure 8.7.3 shows the CMD Map for P4/5, Harrow Road Ticket Hall and overbridge for the 15 minute peak. Access to/from Harrow Road Entrance and the overbridge passageways provide acceptable levels of vertical circulation capacity. As was apparent on the overbridge map the north staircase serving P4/5 is underutilised compared to the southern staircase due to the latter having a more centralised location. P4 and P5 are mostly LOS B/C and show that they are able to accommodate the AM peak demand. The gateline shows sufficient capacity during this period.

Figure 8.7.4 shows the CHD Map for the same areas as in Figure 8.7.3. The interchange area on the overbridge is at LOS C for up to 2 and a half minutes. Both the platforms and the stairway accesses experience LOS C for up to 2.5 minutes. Those at the Harrow Road entrance are above LOS C for over 2.5 minutes, however the lack of use of the neighbouring staircase highlights this is not an issue of congestion as it saw little use. These results show that all the areas mentioned are generally able to cope with the demand during the AM peak.

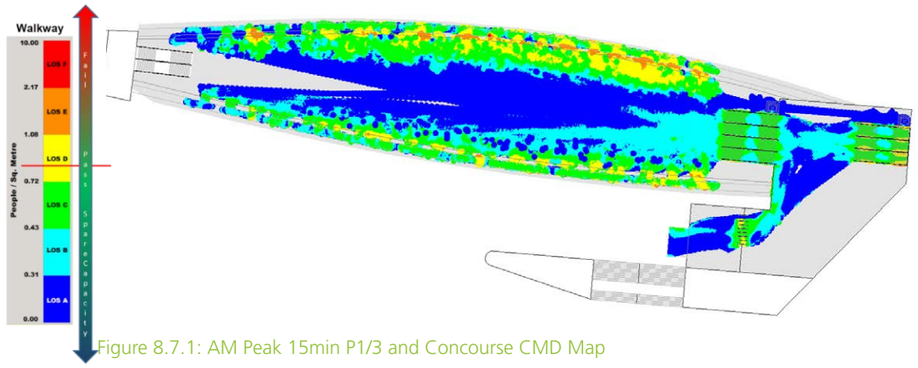


Figure 8.7.1: AM Peak 15min P1/3 and Concourse CMD Map

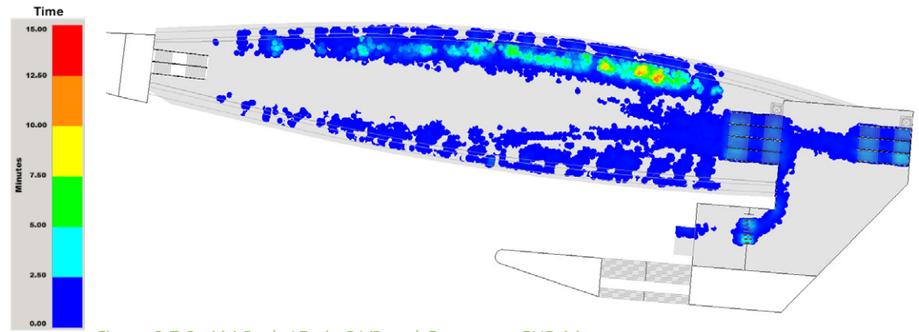


Figure 8.7.2: AM Peak 15min P1/3 and Concourse CHD Map

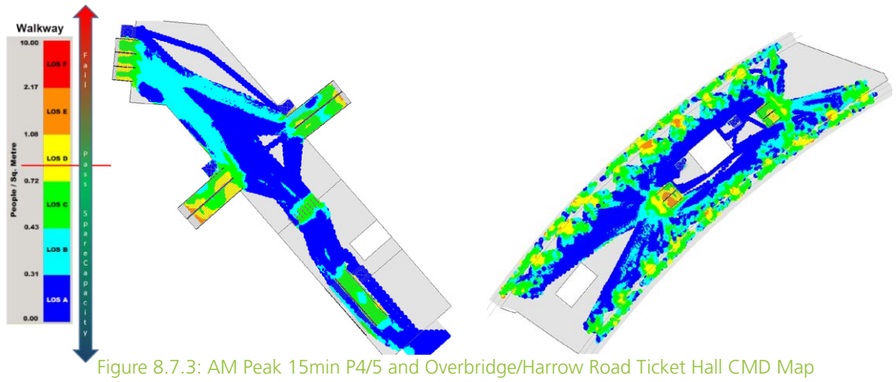


Figure 8.7.3: AM Peak 15min P4/5 and Overbridge/Harrow Road Ticket Hall CMD Map

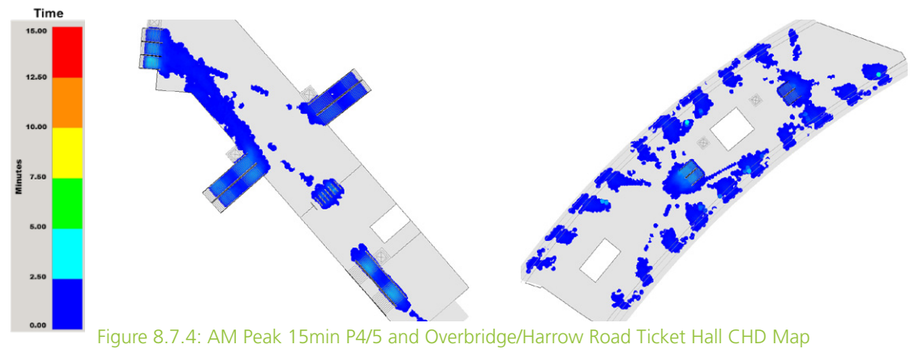


Figure 8.7.4: AM Peak 15min P4/5 and Overbridge/Harrow Road Ticket Hall CHD Map

5.7.2. PM Results

Platforms 1 and 3 and Old Oak Ticket Hall/ Concourse

During the PM, P3 is the worst affected at LOS D/E. High levels of congestion occur as the boarding demand increases. This is in contrast to levels on P1 which is generally acceptable due to a decrease in boarding demand. The stairs from P1/3 and those to the overbridge are at LOS D and E showing that the demand is exceeding vertical circulation capacity. The concourse and entrance area at Old Oak are able to cope with demand well at predominantly LOS A. The gateline also shows sufficient capacity as this time.

P1 reaches LOS C for up to 2.5 minutes with no areas of sustained congestion. P3 is LOS C throughout, up to the whole peak 15. This is due to its' higher boarding demand and the proximity to the access stairs. The stairs, particularly those from the concourse leading up to the overbridge, show sustained congestion (over 7 minutes in some areas) showing that more vertical circulation should be provided due to the high levels of interchange during the PM peak.

Platforms 4 and 5, Overbridge and Harrow Road Ticket Hall

Access to/from Harrow Road entrance is at acceptable levels. Vertical circulation between the overbridge to the concourse suffers from crowding at the top. As was previously seen in the AM peak the access stairs for P4/5 to the overbridge are busier on the south side (LOS C/D) than on the north side (LOS B/C) due to their location on the platform. This difference is more prevalent at the bottom of the stairs on the platform (south is LOS F while north is LOS E/F). Generally, as with the AM peak, both the gateline at Harrow Road and the platforms are able to cope with demand.

Figure 8.7.8 shows that the stairs do not provide sufficient vertical circulation and create sustained congestion (up to 7.5 minutes) particularly at the entrances to these areas. Increasing the provision and possible relocation of those on P4/5 would help to ease congestion.

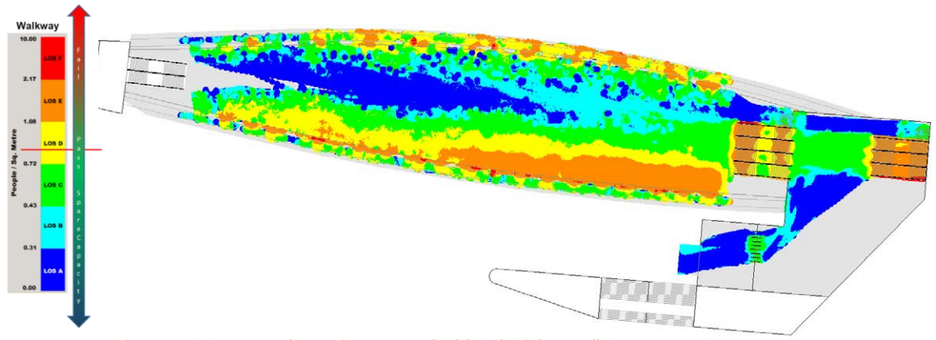


Figure 8.7.5: PM Peak 15min P1/3 and Old Oak Ticket Hall/Concourse CMD Map

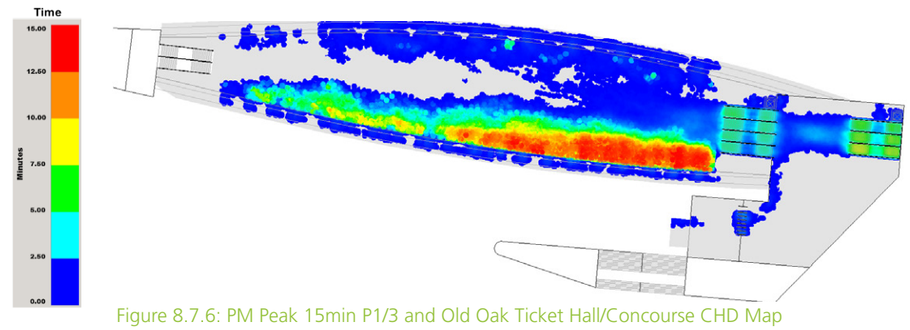


Figure 8.7.6: PM Peak 15min P1/3 and Old Oak Ticket Hall/Concourse CHD Map

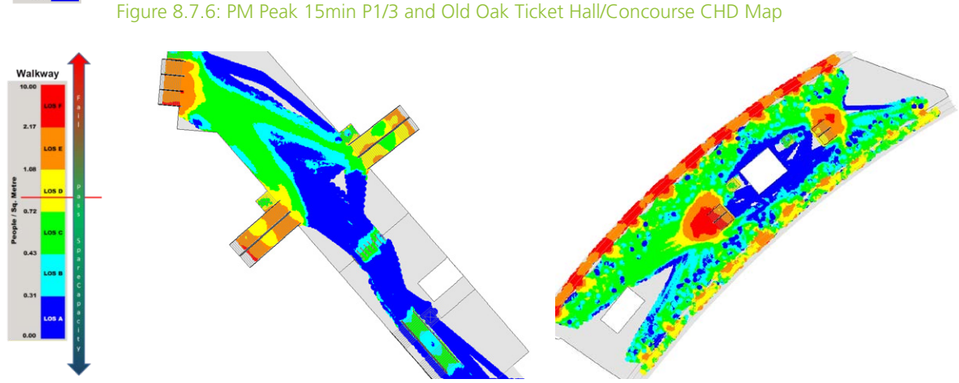


Figure 8.7.7: PM Peak 15min P4/5 and Overbridge/Harrow Road Ticket Hall CMD Maps

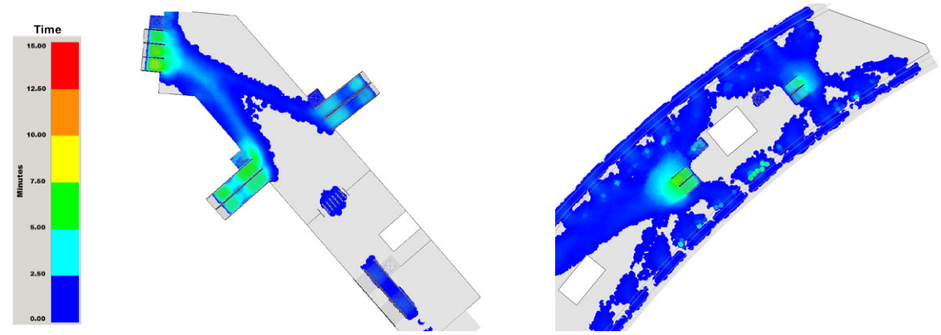


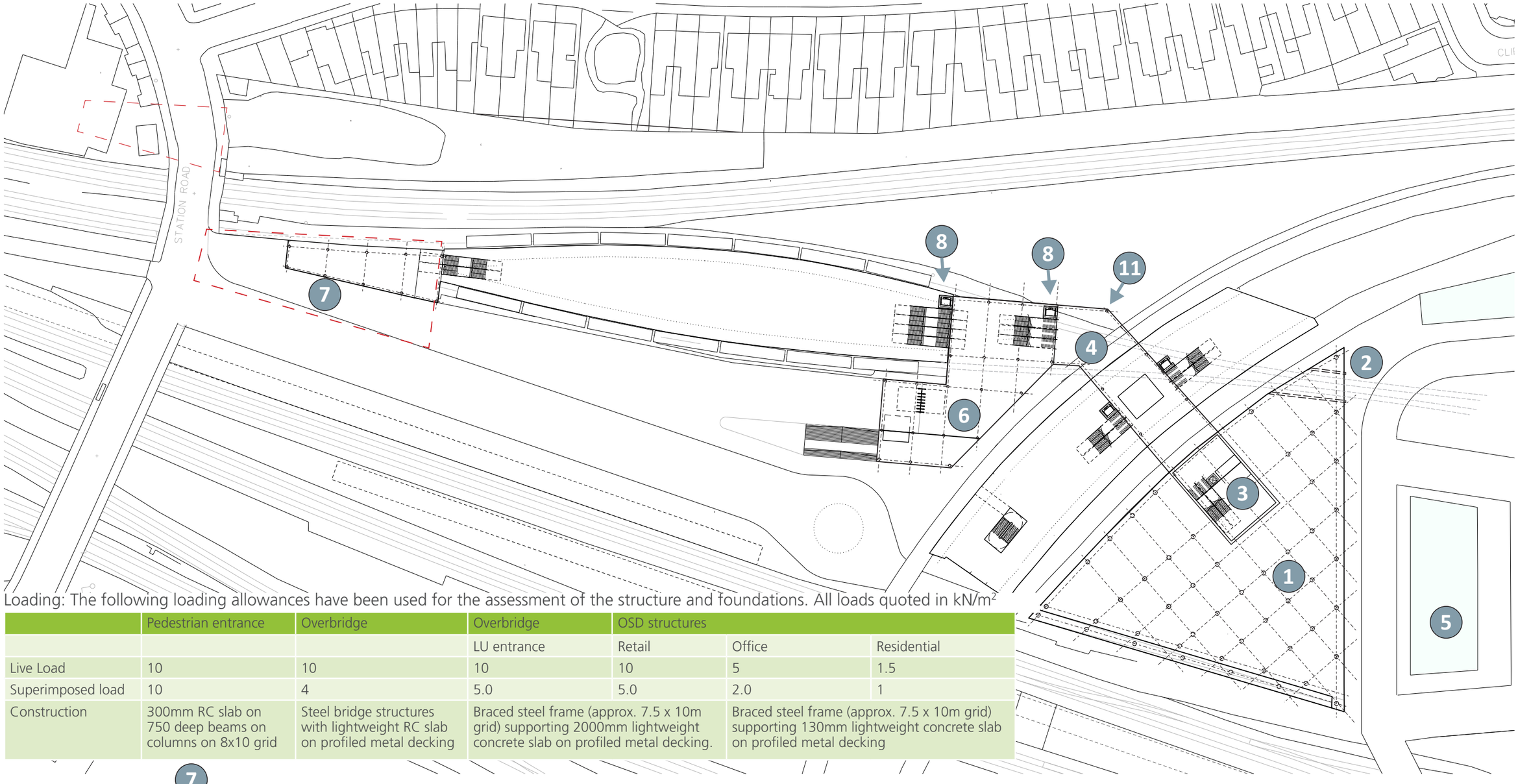
Figure 8.7.8: PM Peak 15min P4/5 and Overbridge/Harrow Road Ticket Hall CHD Map

5.7.3. Conclusions

- The AM peak operates well overall, the PM suffers from congestion due to a lack of vertical circulation provision as well as high boarding demand for P3.
- The north stairs access to P4/5 from the overbridge is underutilised, the south stairs are subject to sustained congestion this is due to the central location of these stairs serving the majority of the platform.
- Crossflows occur on the lower concourse between stairs to overbridge and stairs to P1/3. Extending the run off distance between these is suggested.
- There is underutilised space on overbridge and concourse area, which could be utilised by retail or become a designated dwell area during disruption.

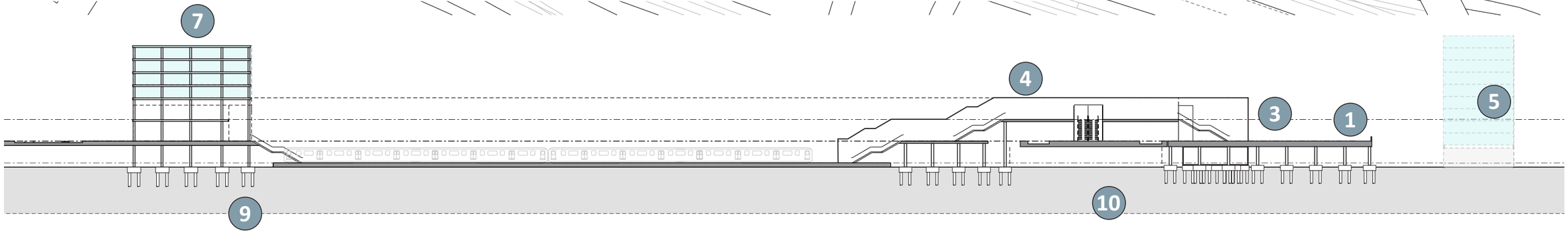
5.7.4. Recommendations Summary

- This is the preferred option for capacity and operations and also provides the optimum intermodal arrangement. It requires minimal changes to the current intermodal arrangement, which serves the design of Option 1 well.
- Widen the landing between vertical circulation for P1/3 and overbridge at Old Oak ticket hall level.
- Revise positioning/provision of vertical circulation for P4/5 so that utilisation is more evenly distributed for platform access/egress.
- Rationalisation of deck underutilised, this space could be potentially used as a dwell area, retail unit or for back of house.
- Line load and train capacity modelling is recommended going forward.
- Sensitivity testing for changes to future tph as well as more thorough platform-train interface modelling.
- Other standard sensitivity tests are advised for scenarios such as escalator maintenance, changes in demand surge, train disruption and emergency evacuation tests.
- Recommend modelling of the initial construction phasing to mitigate impacts and ensure the station is kept operational.



Loading: The following loading allowances have been used for the assessment of the structure and foundations. All loads quoted in kN/m^2

	Pedestrian entrance	Overbridge	Overbridge	OSD structures		
			LU entrance	Retail	Office	Residential
Live Load	10	10	10	10	5	1.5
Superimposed load	10	4	5.0	5.0	2.0	1
Construction	300mm RC slab on 750 deep beams on columns on 8x10 grid	Steel bridge structures with lightweight RC slab on profiled metal decking	Braced steel frame (approx. 7.5 x 10m grid) supporting 2000mm lightweight concrete slab on profiled metal decking.		Braced steel frame (approx. 7.5 x 10m grid) supporting 130mm lightweight concrete slab on profiled metal decking	



5.8. CIVIL AND STRUCTURES

5.8.1. Features

The primary structural and civil works that feature in the Central Option can be summarised as follows:

- A new entrance building and intermediate concourse structure is constructed between the two sets of platforms, directly above the existing LU tracks.
- New overbridges are constructed above existing railway infrastructure. One of which is directly over the existing P2.
- There is a new forecourt built to the east with pedestrian and cycle access.
- The new bridge link towards OPDC is pedestrian/cycle only.
- OSD above station has a relatively small footprint.

5.8.2. Structural Strategy

The previous diagram shows the structural arrangement for the Central Option, where the entrance and interchange concourse is built over the eastern end of the Bakerloo Line platforms. All options will involve some construction over the tracks, which would have to be carried out during planned possessions. Where there is significant construction over the platforms as well the level of disruption to the operation of the station and the railway will be increased.

The following notes relate to the annotation on the diagram.

1. Suspended reinforced concrete (RC) slab at elevated track level for new pedestrian forecourt. The slab is supported on reinforced concrete columns founded on pilecaps at ground level. There is a ramp to the south of the slab (also in reinforced concrete) which can provide pedestrian or vehicle access from ground level to the forecourt.
2. The Bakerloo Line tracks pass under the slab, so walls are constructed either side with a suitable offset to facilitate construction. Slab over is built with permanent formwork panels to minimise possession time required.
3. Station entrance structure is shown as a RC box construction founded on a piled raft at existing ground level. The entrance box structure stabilises forecourt slab which is otherwise independent of the surrounding structures. Access to the forecourt slab will also be provided via new bridge and slab structures to the south and east – these are outside the scope of this study.
4. Lightweight steel overbridge structure spanning over the tracks to supports in the centre of the platform. The central supports are founded on pad foundations on the existing platform, which will be assessed for this additional load. The Bakerloo Line tracks pass under the platform in the vicinity of the overbridge foundations, so it is likely to be preferable to demonstrate that the existing viaduct structure can carry the additional loads without the need for further foundations to be constructed at track level where space is constrained.
5. Adjacent commercial development (outside scope of this study)
6. Station entrance and interchange structures in steel with lightweight concrete floor slabs on profiled metal decking, with braced bays arranged to fit around stair and lift cores. Steel columns are founded on pilecaps at existing ground level.
7. Emergency escape stair structure with OSD over spanning over the eastbound Bakerloo line onto a line of columns between the two tracks. Edge of the building to be brought south to avoid clashing with the westbound Bakerloo Line. The building is narrow and will have a moment-frame structure – there is no space for bracing as the frame spans over the track. Piled foundations will be installed from the existing platform level. This is a constrained site and the number of storeys over will be limited.
8. To avoid impacting on the operation of the line, lifts may need to be brought further away from the tracks to allow adequate space for construction of the shafts and their foundations. The depth of lift pits may prevent lifts from being located above the Bakerloo Line tracks as shown whilst maintaining adequate headroom. However, there is sufficient space on the concourse to allow for lift and stair locations to be reconfigured in order to avoid these potential clashes.
9. Piled foundations under each column location. Allow for pilecaps supported on pairs of 750mm diameter CFA piles, 25-30m long at each column location.
10. Existing station structure remains as is, with supports for the lightweight overbridge to bear on the existing island platform.
11. Column supporting steel overbridge is located across the tracks from the rest of the structure. It will be easier to construct the overbridge if all the supporting structure is to one side of the tracks and the supporting beams do not span over the tracks. The configuration can likely be developed to improve the situation, but the arrangement is not as favourable as in the Offset Option.

5.8.3. Relative Merits and Challenges

A relatively high degree of construction is to be undertaken above existing railway infrastructure. It will be relatively difficult to construct the concourse above existing BLL rail and platforms and is likely to require more railway possessions in order to complete the works.

For the vertical circulation connecting P1/3 to the intermediate concourse to be constructed, P2 must first be removed from service. Construction access and available worksite areas will be restricted.

The elevated eastern forecourt can be less substantial in size than for the Dual and Offset Options, as it does not need to accommodate vehicular access. However, access to this area is restricted until the road link to Scrubs Lane is established, which first requires the removal of the TMD.

While the OSD above the station is smaller, it is to be constructed next to the intermodal forecourt which must remain operational throughout. As a result, there will be restricted worksite space making construction relatively challenging.

5.9. ENVIRONMENT AND CONSENTS

5.9.1. Environment

All three options (Central, Dual and Offset) will all affect a Grade I Site of Importance for Nature Conservation (SINC) covering the area of embankment between the bus stand and the station. Policy related to this (OS12, LB Brent UPDP saved policy) states that "development will not be permitted on or adjacent to… Sites of Metropolitan and Borough (Grade I) Nature Conservation Importance, unless it is demonstrated, that there will be no adverse effect on nature conservation". Whilst this is unlikely to prevent development of the station, it is suggested that, where possible on operational station structures, some ecological habitat replacement is included in the options (e.g. green/brown roof).

More widely the proposed development east of the station will impinge on the ecological designations (within LB Brent only) of the site. The area north of the LU/DC lines is also designated as a Grade I Site of Nature Conservation Interest and a wildlife corridor. Again, whilst this is unlikely to prevent development of the station, it is suggested that, where possible, some ecological habitat replacement is included in the options (e.g. green/brown roof).

5.9.2. Planning

All three options are on a site which is identified in the LB Brent Local Plan Core Strategy as being Strategic Industrial Land (SIL) which under Policy CP20 would be protected. Emerging OPDC Policy indicates that part of the site would be made available for mixed use or residential development. However, if the site is developed as OSD, this could allow some strategic industrial use to remain, whilst other uses are developed above.

This is an increasingly common approach, and many industrial uses tend to be no louder or disruptive than other ground floor uses such as offices (with weekly fire alarm tests) and retail (requiring constant deliveries of stock). In Camden for example, a large student housing scheme was built above a Travis Perkins timber yard, and many light industrial uses such as distribution already take place in retail zoned premises under housing developments.

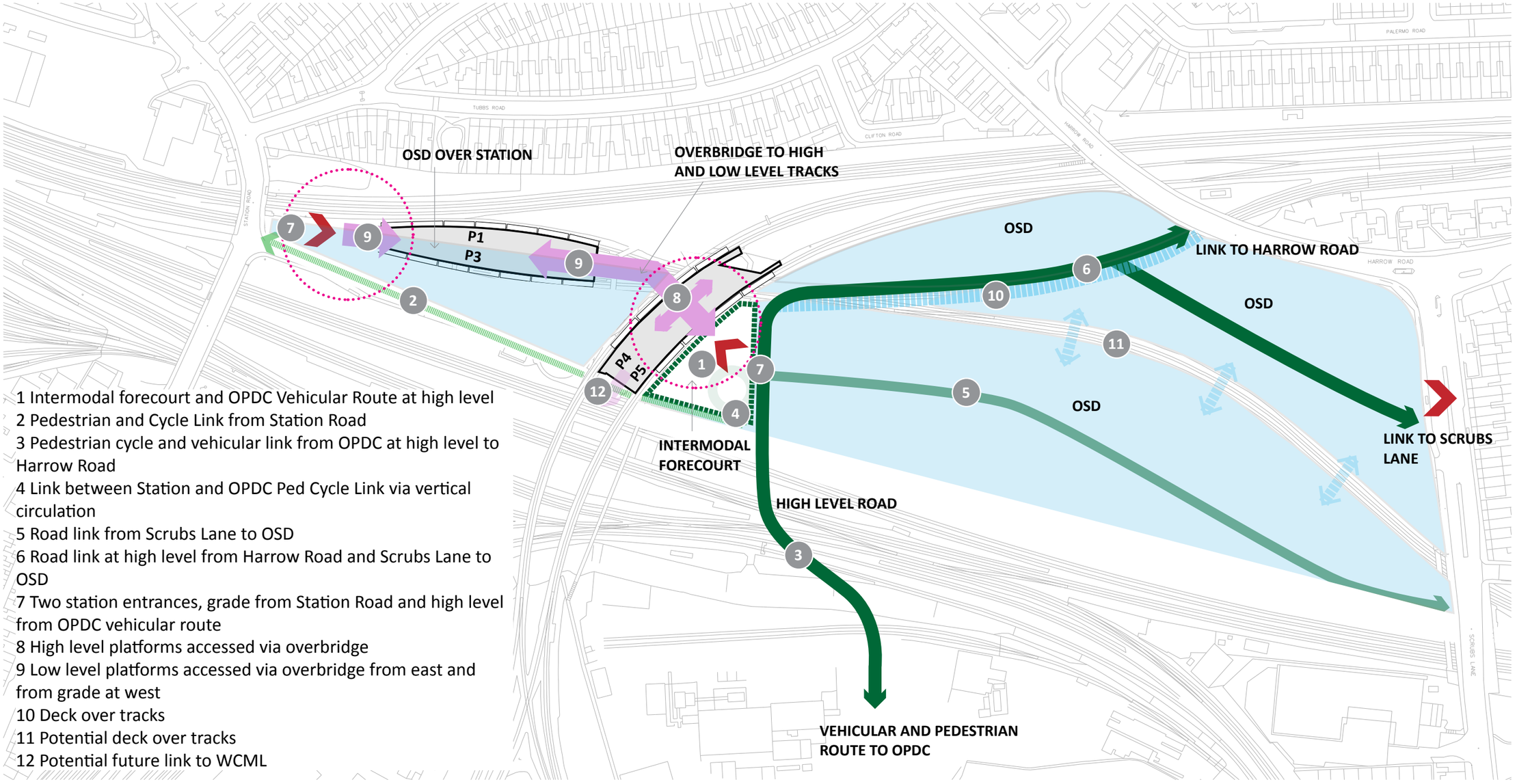
ATKINS WestonWilliamson+Partners

6.0 OPTION 2 - DUAL OPTION

DUAL OPTION

SCENARIO 10 (+15% UPLIFT) - 2041 + HS2 + OPDC

N



1 Intermodal forecourt and OPDC Vehicular Route at high level
2 Pedestrian and Cycle Link from Station Road
3 Pedestrian cycle and vehicular link from OPDC at high level to Harrow Road
4 Link between Station and OPDC Ped Cycle Link via vertical circulation
5 Road link from Scrubs Lane to OSD
6 Road link at high level from Harrow Road and Scrubs Lane to OSD
7 Two station entrances, grade from Station Road and high level from OPDC vehicular route
8 High level platforms accessed via overbridge
9 Low level platforms accessed via overbridge from east and from grade at west
10 Deck over tracks
11 Potential deck over tracks
12 Potential future link to WCML

OSD SITES
PEDESTRIAN AND CYCLE LINKS
VEHICULAR LINKS
STATION ENTRANCE

6.0 DUAL OPTION

6.1. DESCRIPTION OF SCHEME

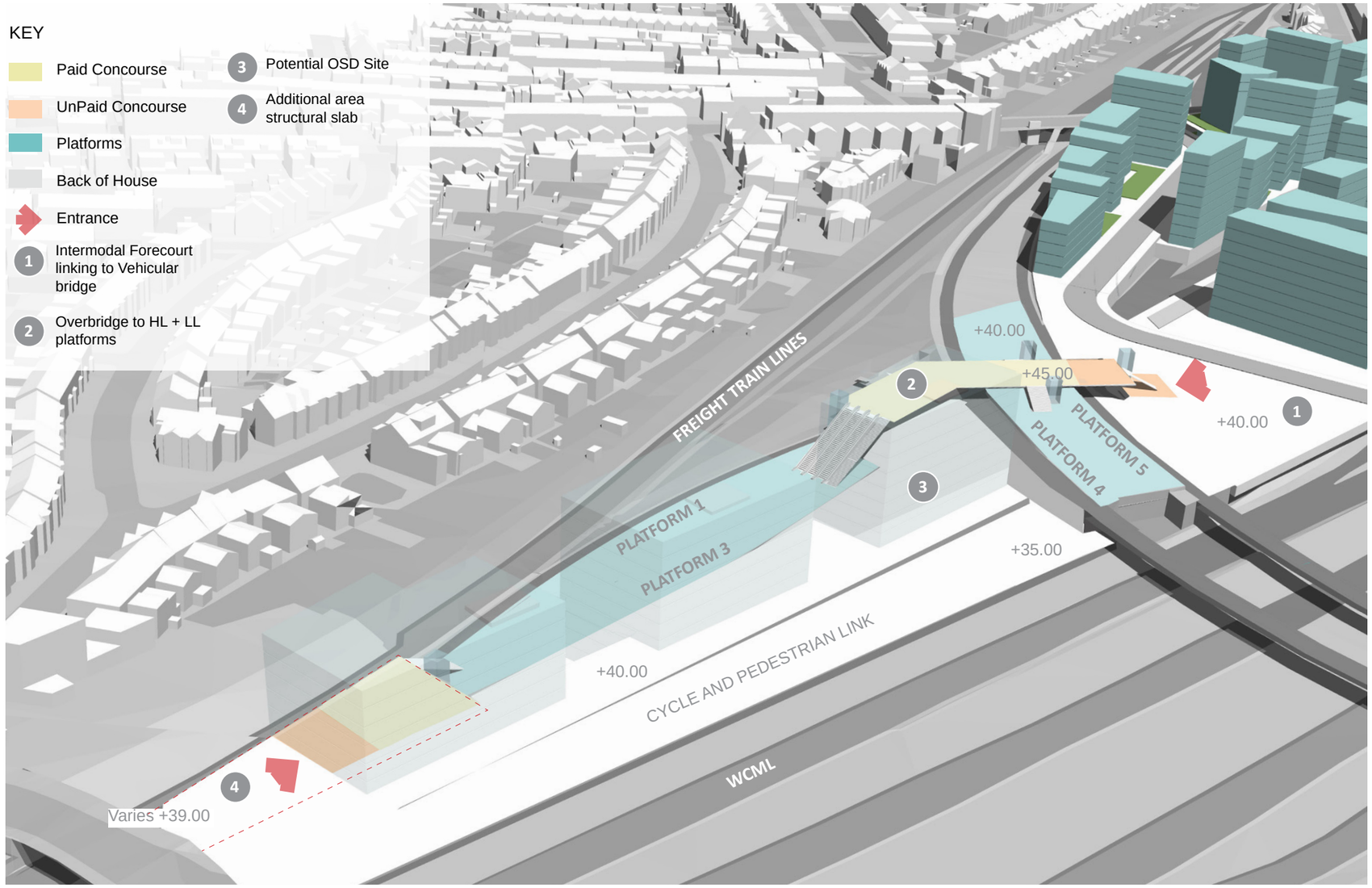
The Dual Option entrances are located at the east and west ends of the station. The main entrance and intermodal forecourt are located to the east side of the station at podium deck level within the proposed area of OSD.

A new road bridge across the WCML will provide north south connectivity for local buses, taxis, cycles and pedestrians linking Hythe Road station and OPDC development in the south to Willesden Junction and Harlesden beyond.

Central to this station scheme is the overbridge which provides the interchange route between HL and LL platforms. This overbridge spans across P4/5, between the intermodal forecourt, and P1/3. The level change between LL platforms and overbridge is 10m, which exceeds the maximum of 5m permitted for stairs and will require escalators and lifts (Station Planning standards and guidelines). Stairs drop down from the overbridge to provide access to the HL platforms.

As for the other options, it is assumed that P2 has been removed to create a larger island platform. The Dual Option consolidates platform support accommodation areas into the entrance buildings freeing up waiting areas for passengers on the platforms during perturbed scenarios.

Relocating the intermodal forecourt to the east side of the station provides greater potential for OSD in Station Approach.



6.2. RAIL OPERATIONS

In the Dual Option, the entrances are split roughly 200m apart, providing direct routes for passengers to local areas in each direction. However, the split entrances may cause staff to be split between critical locations and although the passenger flow within the local area will be improved, it will cause passenger mixing along platforms between entrances. The dual entrances may cause potential elongated evacuation times and due to the sighting of the site accommodation, it is only found at one end of the site.

The Dual Option replicates current operating arrangement and facilities. The current conditions are cramped meaning the new 70sqm may not have capacity to accommodate any growth in train crew numbers due to enhanced service frequency. A benefit of the Dual Option is that the accommodation is placed in or around the bridge over P4/5, therefore in easy reach of P1/3. There are no direct implications on train crew operations specific to each of the three options.

Passive provision has been designed for connection to any new platforms on the slow lines of the WCML that may be built (assumed depot site will be vacated by this time). A disadvantage of the Dual Option is that the station entrances are located further from WCML platforms. For Slow Line platforms to be integrated, an additional bridge would be needed to access the Down Slow Line, and additional gate lines are likely to be required for the Up Slow Line. Operationally this creates three separate stations and leads to three sets of attendant staff and emergency management as well as interchange complexities.

6.3. STATIONS OPERATIONS

6.3.1. Station Management

Placing the entrances at the east and west ends of the station effectively creates two separate operational centres and will potentially make it more difficult to manage the station. Passengers entering through the western entrance will walk through the LL platforms on route to HL platforms making it difficult to manage passenger numbers on the LL platforms particularly in the perturbed scenario. In the event of an operational incident which requires the LL platforms to be closed the west entrance will also be closed. However, it would be possible for passengers arriving from the west to access the HL platforms by using the east entrance, which can be accessed via the unpaid ped/cycle link.

6.3.2. Wayfinding

Passenger routes from station entrances to platforms are direct and intuitive but walking distances from the west entrance to HL are protracted and have 3 changes of level.

6.3.3. Step Free Access

Lift access is provided to all platforms, however interchange travel distances are protracted and potentially crowded through the LL platforms, making PRM passenger experience sub-optimal.

6.4. FIRE AND EMERGENCY MANAGEMENT

6.4.1. Means of Escape

6.4.1.1. Platforms 1 and 3

Egress from the proposed P1/3 will be via the escalators leading to the overbridge to the east, and via stairs to the proposed extended public realm to the west.

With the two proposed exit routes being on opposite ends of this platform, there is a maximum distance of 26m from the extremities of this platform to the platform exits. Dead-ends are not permitted when following the guidance of RSPG. As this dead-end length is only slightly more than the length of a train carriage, and considering the width of this platform (approximately 20m), this dead-end condition may be deemed acceptable by the regulator.

This platform length is approximately 130m, with the distance between exits being approximately 95m. Following the guidance of RSPG, exits should be positioned “with a travel distance of not more than 90m between any two exits”. Despite this distance being exceeded by approximately 5m, it is expected that this will be deemed acceptable by the regulators as it is only slightly over the 90m limit, this platform is in open air and there are no significant dead-end conditions.

At a later design stage, the proposed exits will be assessed to ensure that they provide sufficient width to allow all occupants to clear the platforms and station building within the recommendations set out in the Network Rail Station Capacity Assessment Guidance.

6.4.1.2. Platforms 4 and 5

Egress from the centre of the proposed P4/5 will be via stairs leading to the proposed new overbridge, with an additional egress to the south of this platform via stairs and an enclosed corridor to an intermodal forecourt towards Station Approach.

With two of the three proposed exits routes being towards the centre of this platform, there is approximately 32m from the north of this platform to the platform exits. Dead-ends are not permitted when following the guidance of RSPG. With 32m of a dead-end, despite the width of this platform being approximately 20m, this dead-end condition may not be deemed acceptable by the regulators and a reconfiguration of the overbridge, or the provision of an additional exit to the north of this platform may be required.

Following the guidance of RSPG, exits should be positioned “with a travel distance of not more than 90m between any two exits”. This platform length is approximately 110m, with the distance between exits being no greater than 36m. As such, this recommendation of RSPG is addressed.

At a later design stage, the proposed exits will be assessed to ensure that they provide sufficient width to allow all occupants to clear the platforms and station building within the recommendations set out in the Network Rail Station Capacity Assessment Guidance.

6.4.2. Egress for persons of reduced mobility

Both exits from P1/3 will be step free, via lifts, for the evacuation of Persons with Reduced Mobility (PRMs). These lifts will be required to be configured as evacuation lifts.

The exits to the centre of P4/5 to the new overbridge will be step free, via lifts, for the evacuation of PRMs. These lifts will be required to be configured as evacuation lifts. In the current design there is no provision of step free egress to the south of this platform. A plan should be put in place to ensure there is a procedure for the evacuation of PRM occupants from this end of the platform.

The options for the evacuation of PRM occupants include:

- Providing, where practicable, step free escape routes directly to a place of safety;
- Providing lifts, configured as evacuation lifts; and
- Use of evacuation chairs and/or powered stair climbers.

6.4.3. Fire-Fighter Access

With fire-fighter access possible from both Station Road and from the new intermodal forecourt to the east, there is good access to both platforms and the proposed concourse. It should, however, be discussed with the relevant fire authority whether additional fire-fighter appliance access will be required to serve the platforms.

6.4.4. Fire-Fighting Equipment (Fixed and Portable)

It is assumed that no dry mains are provided along the existing platforms and that dry mains will not be required for the proposed new platforms. This should be confirmed with the relevant fire authority. It should be ensured that access to a fire hydrant is available within 90m from the entrance to the station building.

The type and location of portable fire-fighting equipment should be determined by means of a fire risk assessment and should be in accordance with BS 5306 Part 8.

6.4.5. Fire Detection and Alarm

RSPG B-2 recommends that an electrical fire alarm should be provided which is capable of manual operation by the public or staff. To comply with this, the station building will be provided throughout with a manual alarm system. This will include the provision of manual call points on the platforms.

A survey of the existing station building will be required in order to determine the current fire detection and alarm provision and to establish how this will be interfaced with the proposed system.

Automatic fire detection will be provided in all lift shafts.

6.4.6. Fire Suppression Systems

Suppression systems for life safety purposes are not required in the Building Regulations, however RSPG B-2 does recommend the use of suppression systems in machine and plant rooms. There may be potential to omit this requirement for the use of suppression systems as Willesden Junction Station is a surface station and the plant rooms will provide minimal risk to life safety. This will be required to be discussed with and agreed by all relevant stakeholders.

6.4.7. Fire Ventilation and Pressurisation Systems

As the proposed new platforms are in the open air, there is no requirement for any ventilation or pressurisation.

6.4.8. Fire Separation, Compartmentation and Structural Fire Protection

Any accommodation on the proposed new platforms will be provided with smoke containment in the form of compartmentation in compliance with RSPG B-2.

Structural fire resistance will follow the prescriptive guidance of Approved Document B.

6.4.9. Control of the Reaction-to-Fire Properties of Materials

The presence of combustible materials on the proposed new platforms will be limited to ensure that any outbreak of fire will be unlikely to develop to a significant size.

6.4.10. Fire Safety Signage

Fire safety signage will be provided throughout to comply with BS 5499.

6.4.11. Emergency Lighting

Emergency lighting will be provided to the stairs, PRM lift and along all escape routes in compliance with BS 5266.

6.4.12. Conclusion

- Access for fire engines is provided from the east via the intermodal forecourt and the urban realm associated with the western entrance.
- Firefighter intervention access is provided via stairs or escalators (pending agreement with London Fire Brigade in later stage design) at each end of the LL platforms. This is sub-optimal having extended travel distance at platform level. Good access is provided to the HL platforms from the overbridge.
- Escape stairs are provided from the south of P4/5, leading downwards to grade level.

On completion of the proposed works, the new platforms will be compliant with the guidance set out in Approved Document B 2010 edition, the Railway Safety Principles and Guidance and the British Standards.

6.5. URBAN REALM AND PLACE MAKING

6.5.1. Option Overview

This option for the redevelopment of the station would be accessed from two new entrances, one at the western end of P1/3 and a second new entrance on the eastern side. The two entrances would take passengers into a new linear concourse, which would provide space for ticketing and waiting. Those approaching from the west would pass along P1/3 to reach this new concourse area, which forms an elevated corridor bridging over P4/5 to serve the new eastern entrance.

Interchange in the western side would become street-based, with bus stops relocated to the main road and doorway enhancements to Station Approach to improve connectivity. Additionally, cycle parking would be provided on Station Approach linked to the proposed east-west pedestrian and cyclist connection. A new forecourt would be created on the eastern side to accommodate car and taxi interchange and also to support local bus routes to the east. Station facilities and entrances would be shared between the two sides.

6.5.2. Urban Realm and Place Making Impacts

6.5.2.1. Efficiency

This option would be quite neutral for interchange efficiency. The main bus facilities would be relocated to the east, but some would be retained on street to the west, for operational reasons. However, while these are further away from the station than at present, as the west side entrance will be moved further west, there will be a neutral impact for pedestrians. A new pedestrian crossing may also be desirable to improve access to the northbound bus stop.

The potential for new interchange on the east is the same as in the Offset Option and this would be efficient as it is in direct line of sight to the new entrance and will allow people to get to other modes far more easily than they can currently.

6.5.2.2. Legibility

The architectural design of the new station buildings will help with legibility and wayfinding for pedestrians navigating the local environment. The new western entrance would improve legibility as it is visible from Station Road and with a clear architectural hierarchy, this will allow people to easily distinguish the station entrances from those to the OSD, without relying on signage. The new eastern entrance, which will face directly onto a new local highway network, is a great improvement over the existing situation. People using this entrance should also be able to get a sense of the primary routes for walking and cycling from design changes such as the quality and type of materials, or footway and carriageway widths – which can give subtle hints as to direction and routes for people wanting the station, or just looking to move past as they travel between other points in the local area. There is an important interface between visibility and legibility and consideration must be given to the primary movement routes and how people can perceive their surroundings from these. More consideration of all these aspects will be expected as the design progresses to a greater level of refinement and detail.

6.5.2.3. Permeability

In this option there will be an east-west route provided for cyclists and pedestrians using the existing low level vehicle access from Station Approach. This will provide an unpaid route and improve permeability over the existing situation. There will then be two new entrances provided to the station which makes it less permeable that the current station in terms of access points, but the legibility of these will be improved so wayfinding will be improved as a whole. The internal movement routes do not lend themselves to an unpaid internal route.

6.5.2.4. Sense of Place

The improved legibility of the entrances will enhance the overall sense of place at the station. Having a strong and visible street presence is an important factor in sense of place and for people in the vicinity the building and associated public spaces will be recognisable and easily identified both at day and night. The linear concourse will also help with sense of place as it will be visible from the entrances. The opportunities for high quality public realm at both entrances, with identifiable station forecourts will help to integrate the station into the wider urban fabric.

6.5.2.5. Townscape

As well as helping with Sense of Place, the new forecourts at both the west and east, and the visible entrances provide an opportunity to deliver a strong piece of new townscape which integrates active frontages, mixed uses and activates a vibrant street scape. The station entrance can be a focus within this, easily recognisable and legible. While Harrow Road is currently the main street frontage on the east, the opportunities here for OSD mean that a new area of townscape can be created for the station to sit within. On the west side, this option will deliver the most visible change and have the most presence on-street and within the existing townscape. There are more limited opportunities for OSD on this side, so the ancillary benefits of providing a new and enhanced townscape through development are more limited, but the entrance may make up for this to a certain extent.

6.5.2.6. Accessibility

The new entrances would both provide step-free access to the station. The station would still be over split levels, and while lifts / escalators could be provided, it is still likely to be complicated for the disabled, elderly and families with young children or luggage. The unpaid link under the tracks between east and west sides negotiates a significant change in level. A ramp is envisaged to tackle this height difference, the arrangement of which will be developed at the next design stage.

6.5.2.7. Community

The opportunities to enhance a sense of community through this station option are more balanced between the eastern and western sides as both will have new forecourt spaces that could provide a space for events/markets etc. As a whole, the option brings improved benefits to the community over the existing situation, but still has limitations such as compromised bus access on the west. The environment around the interchange will be enhanced through planting, becoming a more colourful and pleasant local asset.

6.5.2.8. Economy

This option provides good opportunities for OSD and development. There are significant areas to the east and these are common to all options. The potential for activating the station forecourt are to be explored further, as there is plenty of room for commercial uses which could be used to activate the streets and frontages. By relocating the primary area for interchange away from Station Approach, greater potential is also opened up to the west.

6.5.3. Conclusion

- Provision of direct entrance onto Station Road would improve the existing townscape and promote wider regeneration.
- Existing bus interchange retained, but the new entrance location will make access more complicated.
- Linear concourses make a legible interchange, but force people to walk along platforms which is less desirable.
- Less opportunity for development than in other options.

In terms of the Urban Realm this option brings multiple benefits over the existing station and is better than the Central Option as it has the benefits that come with the strengthened presence on Station Road. The new interchange on the east, with potential for some retention of the interchange facilities on the west means less disruption, but this also brings with it the associated disadvantages of this interchange, such as the level changes.

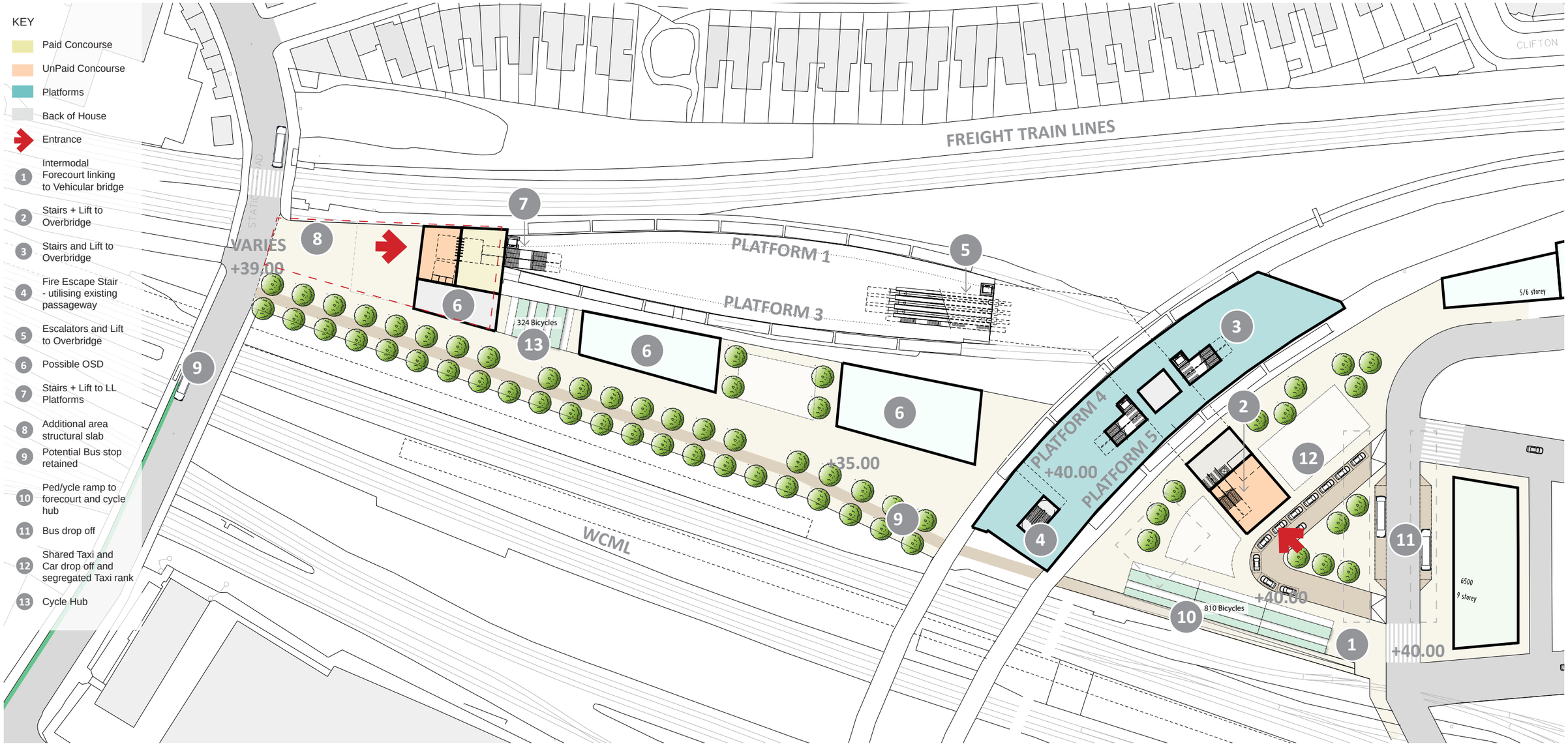
In the longer term, this increases complexity of constructing an upgrade to provide access to platforms on the WCML should they be added, as the central focus of the station – the linear concourse – is further north than in other options. There is also limited scope to deliver jobs and homes as part of the station development, particularly on the west side of the station.

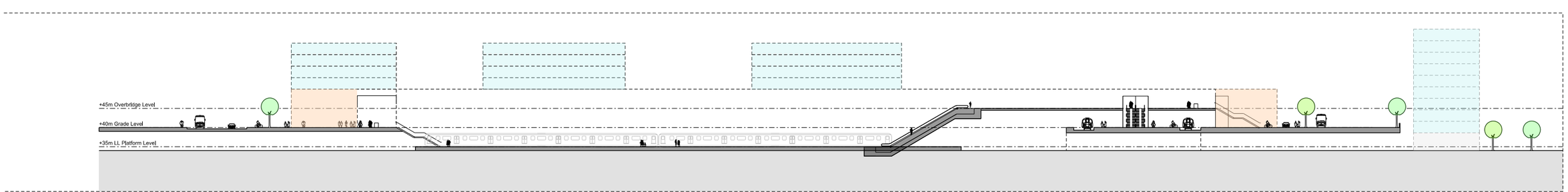
6.6. TRANSPORT PLANNING

With this option, the proposed Station Road entrance to the station would be slightly nearer the existing passenger catchment to the north in Harlesden than the current entrance and it would face Station Road, which is likely to continue to be served by some bus routes. The proposed additional station entrance to the southeast of the NLL would be convenient for access by the future catchment created by the proposed OSD immediately to the east and the OPDC to the south via the proposed bridge over the WCML.

The proposed vehicular bridge over the WCML provides the opportunity for bus routes connecting the OPDC to the south with Station Approach/Old Oak Lane and Harrow Road via Willesden Junction Station. This would optimise accessibility to the station by bus to and from the OPDC to the south and enhance connectivity between the OPDC and Harlesden to the north. The proposed interchange forecourt immediately adjacent to the proposed additional eastern station entrance would build on this opportunity for enhanced bus connectivity, by providing an optimally located interchange facility. It is noted that to maximise the potential bus connectivity benefits a co-ordinated reworking of the bus network and the interchange points with the station would need to occur at subsequent design phases.

- Intermodal interchange on east side of station adjacent to OSD and OPDC vehicular route at high level.
- Pedestrian and cycle links from Station Road and from OPDC at high level.
- Link between Station Road and OPDC pedestrian/cycle link via vertical circulation.
- Road links from Scrubs Lane to OSD and at high level from Harrow Road and Scrubs Lane to OSD.
- High level vehicular link from OPDC over WCML.
- Two station entrances – at grade from Station Road and high level from OPDC vehicular route.
- Pedestrian and cycle connectivity provided between OPDC, Willesden Junction, Harlesden and Harrow Road/Scrubs Lane.
- Significant opportunity to provide improved bus connectivity over WCML between Harlesden, Harrow Road/Scrubs Lane and OPDC via Willesden Junction.
- Bus interchange likely to be split between proposed intermodal forecourt and Station Road, as some bus routes would continue to operate along Station Road.
- Space for enhanced bus interchange facilities on west side of station may be restricted, especially on Station Road.


KEY
Paid Concourse
UnPaid Concourse
Platforms
Back of House
Entrance
1 Intermodal Forecourt linking to Vehicular bridge
2 Stairs + Lift to Overbridge
3 Stairs and Lift to Overbridge
4 Fire Escape Stair - utilising existing passageway
5 Escalators and Lift to Overbridge
6 Possible OSD
7 Stairs + Lift to LL Platforms
8 Additional area structural slab
9 Potential Bus stop retained
10 Ped/cycle ramp to forecourt and cycle hub
11 Bus drop off
12 Shared Taxi and Car drop off and segregated Taxi rank
13 Cycle Hub
FREIGHT TRAIN LINES
CLIFTON
STATION ROAD
VARIES
+39.00
PLATFORM 1
PLATFORM 3
PLATFORM 4
PLATFORM 5
+40.00
+35.00
324 Bicycles
810 Bicycles
WCML
5/6 storey
6500
9 storey


+45m Overbridge Level
+40m Grade Level
+35m LL Platform Level

6.7. STATION PERFORMANCE – DYNAMIC PASSENGER ANALYSIS

In line with Section 4.3, 70% of exits/entries to the station are assumed to occur at the intermodal forecourt entrance, i.e. for this option to the east (Harrow Road/A404).

This design features escalators with the current configuration of 2-up and 1-down. The configuration of this design is to alleviate congestion on the platform as the primary objective. The orientation of this arrangement can be revised in subsequent modelling at a later date to determine the optimal arrangement.

6.7.1. AM Results

Platforms 1 and 3 and Station Road Ticket Hall/Concourse

Figure 9.7.1 shows the CMD Map for P1/3, Station Road entrance and the concourse area for the 15 minute peak. P1 shows the most congestion at LOS C/D, P3 suffers minor congestion at B/C. Based on this it is evident the platforms are able to cope with the peak demand during the AM. The stairs to/from Station Road entrance and the entrance itself are at acceptable levels. The escalators providing vertical circulation show high densities as to the LOS index used is the Walking LOS and not Stairways LOS. These are used for vertical circulation and also for access/egress to P1/3 for interchange and the primary method of entry/exit to the station at Harrow Road. The transition areas to these escalators are at acceptable levels and the design is able to provide sufficient vertical circulation during the AM peak. The gateline is at LOS C and therefore has capacity for the peak demand.

Figure 9.7.2 shows the CHD Map for P1/3, Station Road entrance and the concourse area for the 15 minute peak. During this time, P1 shows sustained congestion (above LOS C) up to 5 minutes. The remaining areas experience LOS C for up to 2.5 minutes. The concourse and Station Road Entrance vertical circulation are subject to brief times of congestion (above LOS C). Due to the high boarding demand on P1 it is more congested than P3 for this period. As stated previously escalators providing vertical circulation do show sustained high densities due to the LOS index used as Walking LOS and not Stairways LOS. The transition area between these and the platform is subject to only brief congestion.

Platforms 4 and 5, Overbridge and Harrow Road Ticket Hall

Figure 9.7.3 shows the CMD Map for P4-5, Harrow Road Ticket Hall and overbridge for the 15 minute peak. Access to/from Harrow Road Entrance and the overbridge passageways provide adequate vertical circulation. The down escalator access to P1/3 is at LOS D but as this is a queuing area this is acceptable. The access stairs for P4/5 on the overbridge is overall LOS C on both sides, which highlights the advantages of a more centralised location for station access. Both sets of stairs service similar size areas of the platform so demand is evenly split between them. P4 and P5 are mostly LOS B/C and show that they are able to accommodate the AM peak demand. The Harrow Road Ticket Hall gateline shows a good level of service, as do the stairs up to it. This is significant as the primary station access/egress is from this entrance.

Figure 9.7.4 shows the CHD Map for the same areas as in Figure 9.7.3. The interchange area on the overbridge is at LOS C for up to 2 and a half minutes. Both P4/5 experience LOS C for approximately 2.5 minutes. Stairway access points for the overbridge and P4/5 experience LOS C for up to 2.5 minutes. Those at the Harrow Road entrance are above LOS C for over 2.5 minutes, the lack of use of the adjacent staircase highlights this is not a capacity issue. All these results show that all these areas are generally able to cope with the demand during the AM peak. Due to queuing for the down escalator there is sustained levels of service above LOS C.

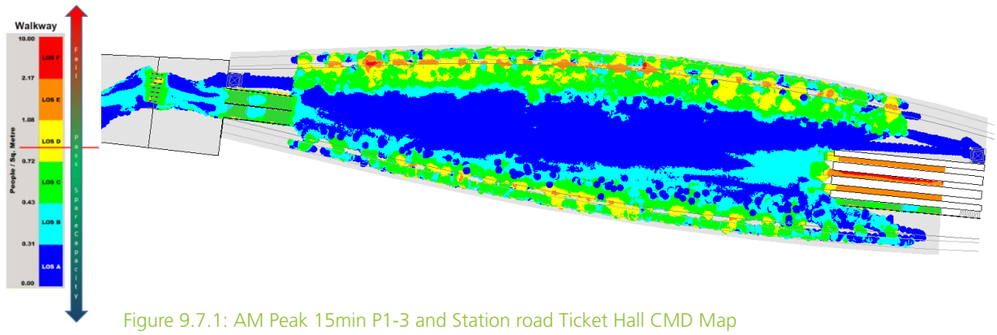


Figure 9.7.1: AM Peak 15min P1-3 and Station road Ticket Hall CMD Map

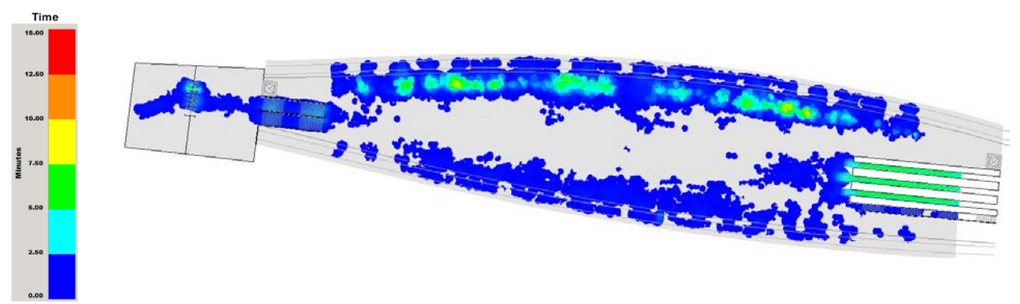


Figure 9.7.2: AM Peak 15min P1-3 and Station Road Ticket Hall CHD Map

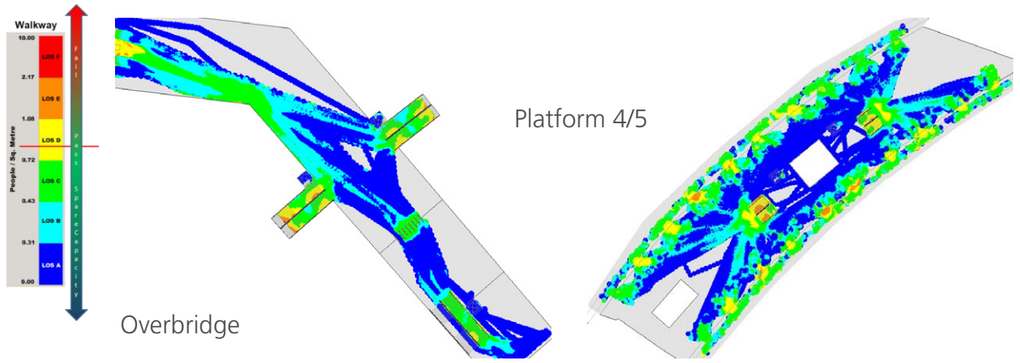


Figure 9.7.3: AM Peak 15min P4/5 and Overbridge/Harrow Road Ticket Hall CMD Map

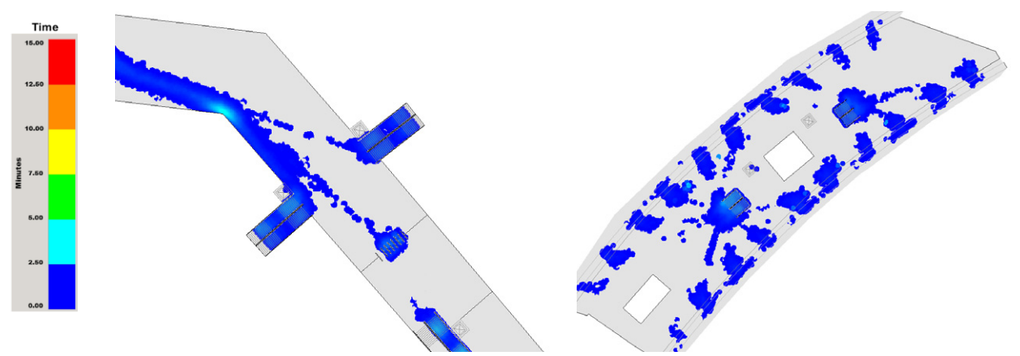


Figure 9.7.4: AM Peak 15min P4/5 and Overbridge/Harrow Road Ticket Hall CHD Map

6.7.2. PM Results

Platforms 1 and 3 and Station Road Ticket Hall/Concourse

During the PM P3 is the worst affected at LOS D/E with high levels of congestion due to the increase in boarding demand. This is in contrast to levels on P1 which were generally acceptable due to lower boarding demand. The concourse and entrance area at Station Road are able to cope with demand well at predominantly LOS A/B. Low levels of access/egress to Station Road entrance mean that vertical circulation provides good low levels of service. The escalators to the overbridge – providing interchange and access to the more utilised entrance at Harrow Road – suffer from significant congestion. Furthermore, the congestion at P3 affects the access to these. The base of the escalators are at LOS E and F indicating higher clearance times. Orientation sensitivity tests for these would be of benefit to determine the optimal arrangement.

The CHD map in Figure 9.7.6 shows that P3 is above LOS C for the whole period of the PM 15 minute peak, this is due to the high boarding demand on P3 during this period. P1 sees little sustained congestion due its lower demand. The Station Road entrance and stairs provide sufficient access as only 30% of passengers use this to access/egress the station. The escalators providing access to the overbridge experience congestion at the transition area between the vertical circulation and the platforms, this is exacerbated by congestion on P3 which impacts on the accessibility of this area. The escalator configuration is currently 2-up and 1-down. The configuration of this design is to alleviate congestion on the platform as the primary objective. The orientation of this arrangement can be revised in subsequent modelling at a later date to determine the optimal arrangement.

Platforms 4 and 5, Overbridge and Harrow Road Ticket Hall

Crowding here is mainly caused by interchangers (Figure 9.7.7). On P4/5, most crowding is experienced near the stairs (LOS E/F) with the south stairs slightly busier than the north as they serve more cars. Access to/from Harrow Road Entrance and the interchange area on the overbridge are at acceptable levels. Above LOS C is experienced on the overbridge with the worst levels (LOS E/F) in front of the escalators. However, some space on the overbridge is underutilised. The access stairs for P4/5 on the overbridge is LOS D/E on both sides but is evenly spread between them due to their centralised location on the platform. P4 and P5 are able to cope with demand during this period but would benefit from improved vertical circulation provision to improve clearance times. The Harrow Road Ticket Hall gateline show a good level of service, as do the stairs up to it. Again, this is significant as the primary station access/egress is located here.

Sustained congestion occurs on the vertical circulation areas (Figure 9.7.8), at the base of both stairs on P4/5 as well as the escalators to/from P1/3. These see levels of service above C for up to and over 7 minutes. P4/5 experiences minor congestion up to 2.5 minutes but crowding occurs at the base of both stairs for over 5 minutes. Vertical circulation is sufficient at the Harrow Road entrance as is the gateline provision here.

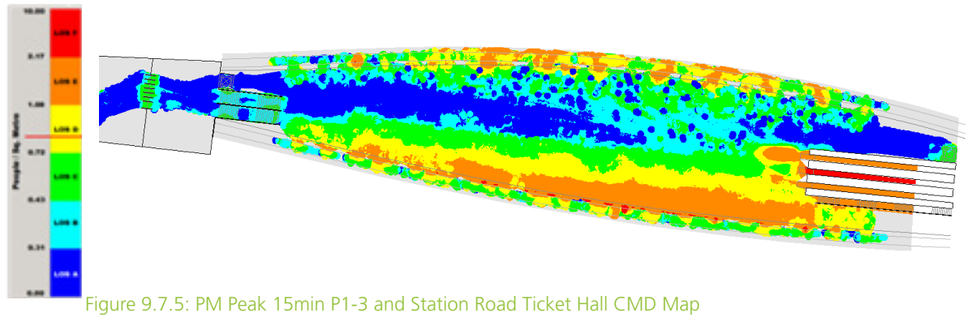


Figure 9.7.5: PM Peak 15min P1-3 and Station Road Ticket Hall CMD Map

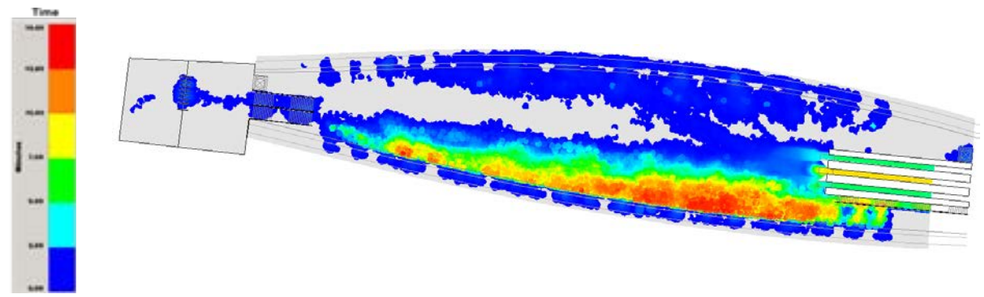


Figure 9.7.6: PM Peak 15min P1-3 and Station Road Ticket Hall CHD Map

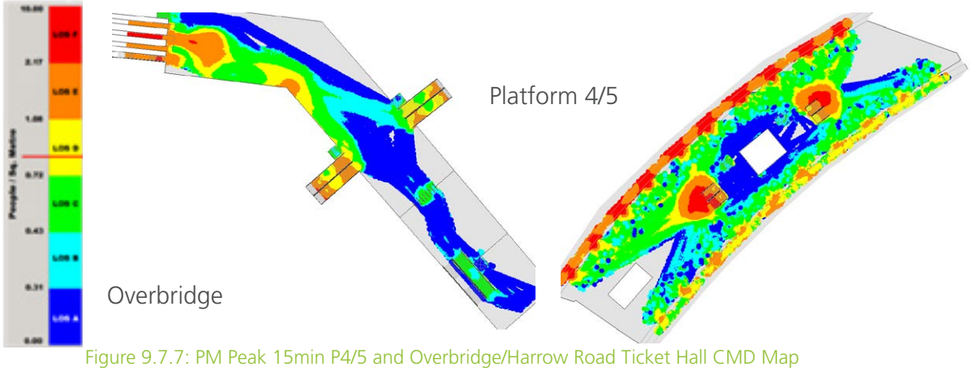


Figure 9.7.7: PM Peak 15min P4/5 and Overbridge/Harrow Road Ticket Hall CMD Map

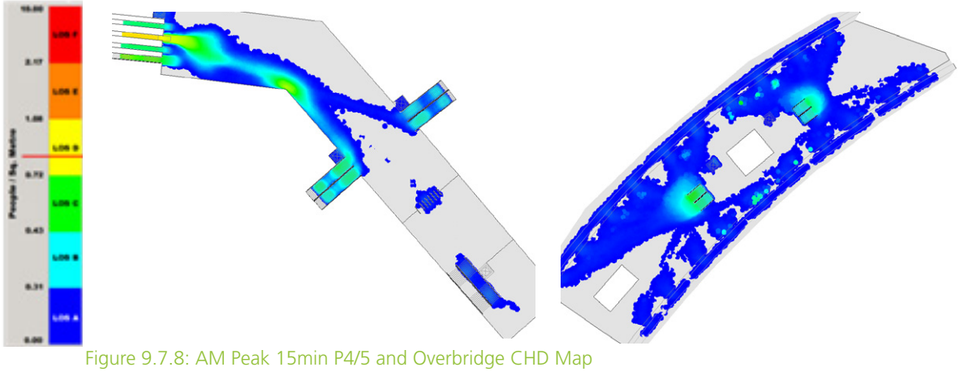


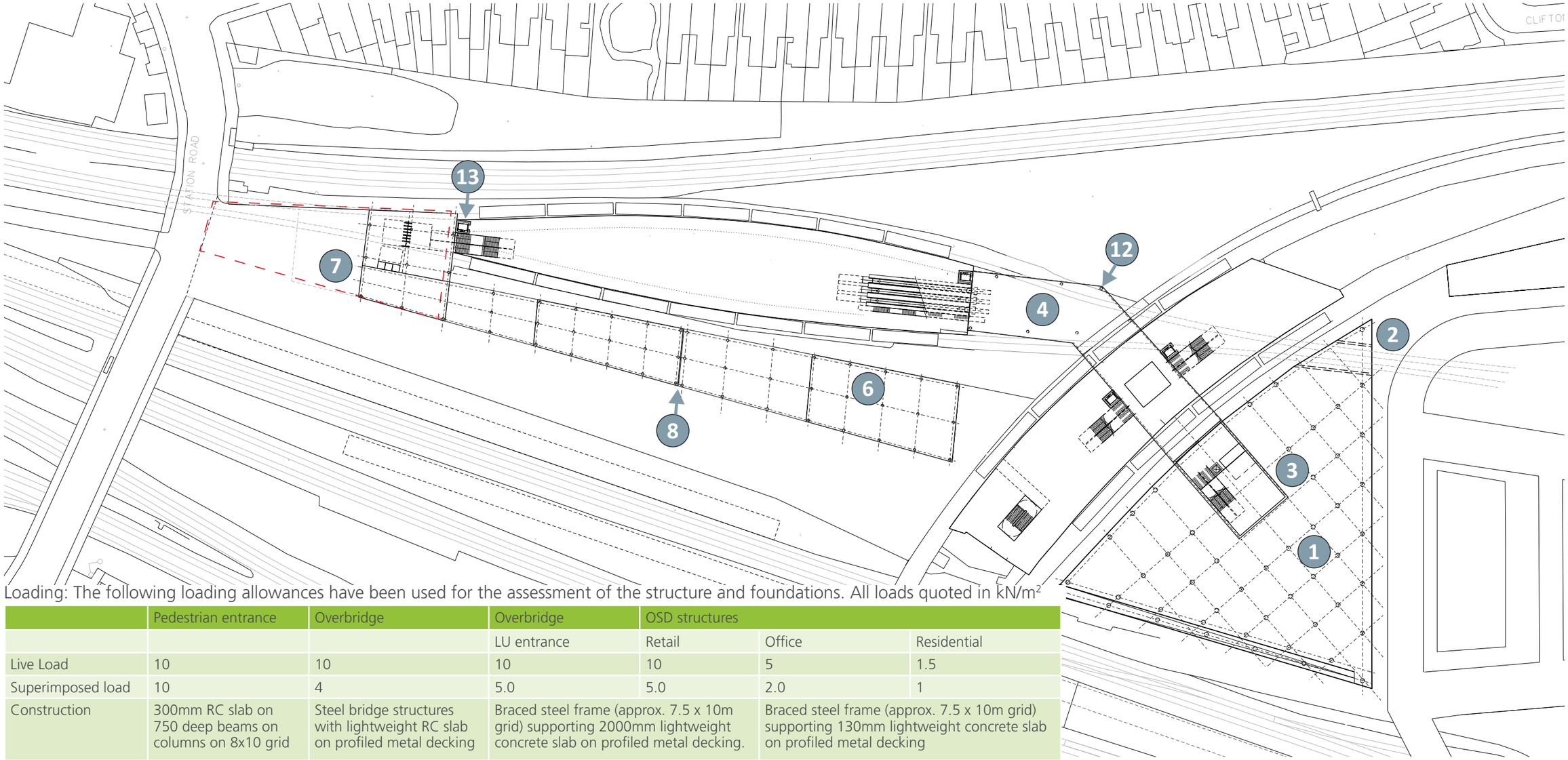
Figure 9.7.8: AM Peak 15min P4/5 and Overbridge CHD Map

6.7.3. Conclusions

- During the AM peak the station operates reasonably well, during the PM peak period vertical circulation is insufficient and this creates congestion.
- High demand on P3 creates crowding on the platform, this has the knock-on effect of reducing access for the escalators up to the overbridge.
- High densities are apparent around the vertical circulation providing access to P4/5 and this affects clearance times on the platform.
- Escalator orientations and vertical circulation would benefit from further analysis to determine optimal setup.
- Option is sub optimum in terms of flow, congestion on P1/3 affects Old Oak to P4/5 entry/exit flow and this also impacts on interchangers.

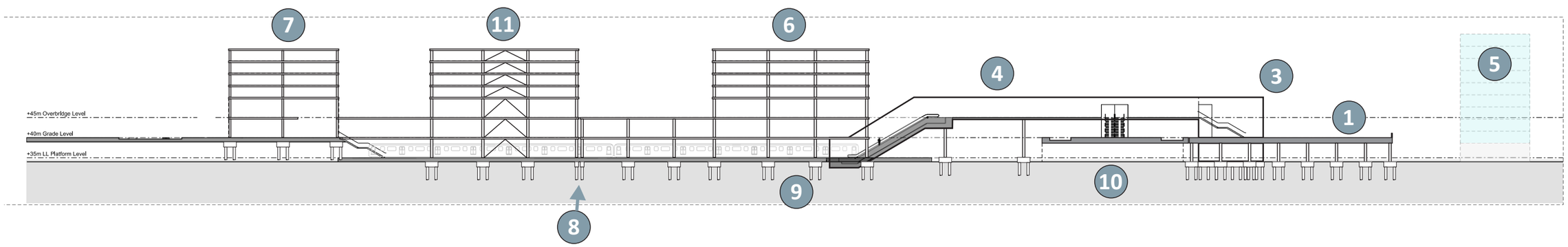
6.7.4. Recommendations Summary

- Revise the escalator orientation and vertical circulation provision/mix and additionally look at the positioning and provision of vertical circulation for P4/5.
- There is a potential rationalisation of underutilised space, this could potentially be used as a dwell area, for retail units or back of house facilities.
- Sensitivity testing for changes to future tph as well as more thorough platform-train interface modelling such as line load and train capacity modelling.
- Varying scenarios tested to assess station operation resilience such as standard escalator maintenance, demand surging, service disruptions and emergency evacuations.
- Recommend modelling of the initial construction phasing to mitigate impacts and ensure the station is kept operational.



Loading: The following loading allowances have been used for the assessment of the structure and foundations. All loads quoted in kN/m^2

	Pedestrian entrance	Overbridge	Overbridge	OSD structures		
			LU entrance	Retail	Office	Residential
Live Load	10	10	10	10	5	1.5
Superimposed load	10	4	5.0	5.0	2.0	1
Construction	300mm RC slab on 750 deep beams on columns on 8x10 grid	Steel bridge structures with lightweight RC slab on profiled metal decking	Braced steel frame (approx. 7.5 x 10m grid) supporting 2000mm lightweight concrete slab on profiled metal decking.	Braced steel frame (approx. 7.5 x 10m grid) supporting 130mm lightweight concrete slab on profiled metal decking		



6.8. CIVIL AND STRUCTURES

6.8.1. Features

The primary structural and civil works that feature in the Dual Option can be summarised as follows:

- A new entrance is constructed above the BLL tracks at the western end of the station fronting onto Station Road.
- A new interchange overbridge is constructed between the two sets of platforms above existing railway infrastructure and directly over the existing P2.
- There is a new elevated intermodal forecourt built to the east with vehicular, pedestrian and cycle access.
- A new vehicular bridge link towards OPDC is constructed (design of which is outside scope of this report).
- A relatively large area of OSD is constructed above the station and the existing site of the intermodal forecourt.

6.8.2. Structural Strategy

The diagram opposite shows the structural arrangement for the Dual Option, where the entrance is separated from the interchange structure. There are two entrances at either end of a linear concourse, with a central interchange overbridge structure. All options will involve some construction over the tracks, which would have to be carried out during planned possessions. Where there is significant construction over the platforms as well the level of disruption to the operation of the station and the railway will be increased.

The following notes relate to the annotation on the diagram.

1. Suspended reinforced concrete slab at elevated track level for new pedestrian forecourt. The slab is supported on RC columns founded on pilecaps at ground level. There is a ramp to the south of the slab (also in reinforced concrete) which can provide pedestrian or vehicle access from ground level to the forecourt.
2. The Bakerloo Line tracks pass under the slab, so walls are constructed either side with a suitable offset to facilitate construction. Slab over is built with permanent formwork panels to minimise possession time required.
3. Station entrance structure is shown as a RC box construction founded on a piled raft at existing ground level. The entrance box structure stabilises forecourt slab which is otherwise independent of the surrounding structures. Access to the forecourt slab will also be provided via new bridge and slab structures to the south and east – these are outside the scope of this study.
4. Lightweight steel overbridge structure spanning over the NLL tracks to supports in the centre of the HL platform. The overbridge is a single-storey lightweight structure founded on pad foundations on the existing platform, which will be assessed for this additional load. Note that the Bakerloo Line tracks pass under the HL platform in the vicinity of the overbridge foundations.
5. Adjacent commercial development (outside scope of this study).
6. Over-site development (OSD) structures in steel with lightweight concrete floor slabs on profiled metal decking, with braced bays arranged to fit around stair and lift cores. Steel columns are founded on pilecaps at existing ground level.
7. LU Entrance structure with OSD over spanning over the eastbound Bakerloo Line, onto a line of columns between the two tracks. Edge of the building to be brought south to avoid clashing with the westbound Bakerloo Line. The building is narrow and will have a moment-frame structure – there is no space for bracing as the frame spans over the track. Piled foundations will be installed from the existing platform level. This is a constrained site and the number of storeys over will be limited.
8. Movement joint where the OSD structures are separated to allow for thermal movement to be accommodated.
9. Piled foundations under each column location. Allow for pilecaps supported on pairs of 750mm diameter CFA piles, 25-30m long at each column location.
10. Existing station structure remains as is, with supports for the lightweight overbridge to bear on the existing island platform.
11. Indicative braced bay within the steel frame of the OSD structure.
12. Column supporting steel overbridge is located across the tracks from the rest of the structure. It will be easier to construct the overbridge if all the supporting structure is to one side of the tracks and the supporting beams do not span over the tracks.
13. Some of the lift locations are located close to the tracks. Construction of the shafts and their foundations will have less of an impact on the line of they are relocated further away from the tracks.

6.8.3. Relative Merits and Challenges

Additional decking will be required to be constructed to accommodate the western entrance, spanning over the existing Bakerloo Line and platforms.

For the overbridge connecting P1/3 to P4/5 to be constructed, P2 must first be removed from service. Construction access and available worksite areas will be restricted. However, this is likely to be less challenging than for the Central Option, where a larger intermediate concourse must also be constructed.

The new elevated intermediate forecourt constructed to the east of the station is more substantial than in the Central Option. However, construction of the vehicular link bridge at an early stage could be used to help improve access to this confined area of the site prior to the removal of the TMD. The programme could potentially be reduced as a result.

While the area of OSD above the station is greater than in the Central and Offset Options, once the new intermodal forecourt is constructed to the east, there is a greatly improved worksite area available for the construction of this OSD to the west.

6.9. ENVIRONMENT AND CONSENTS

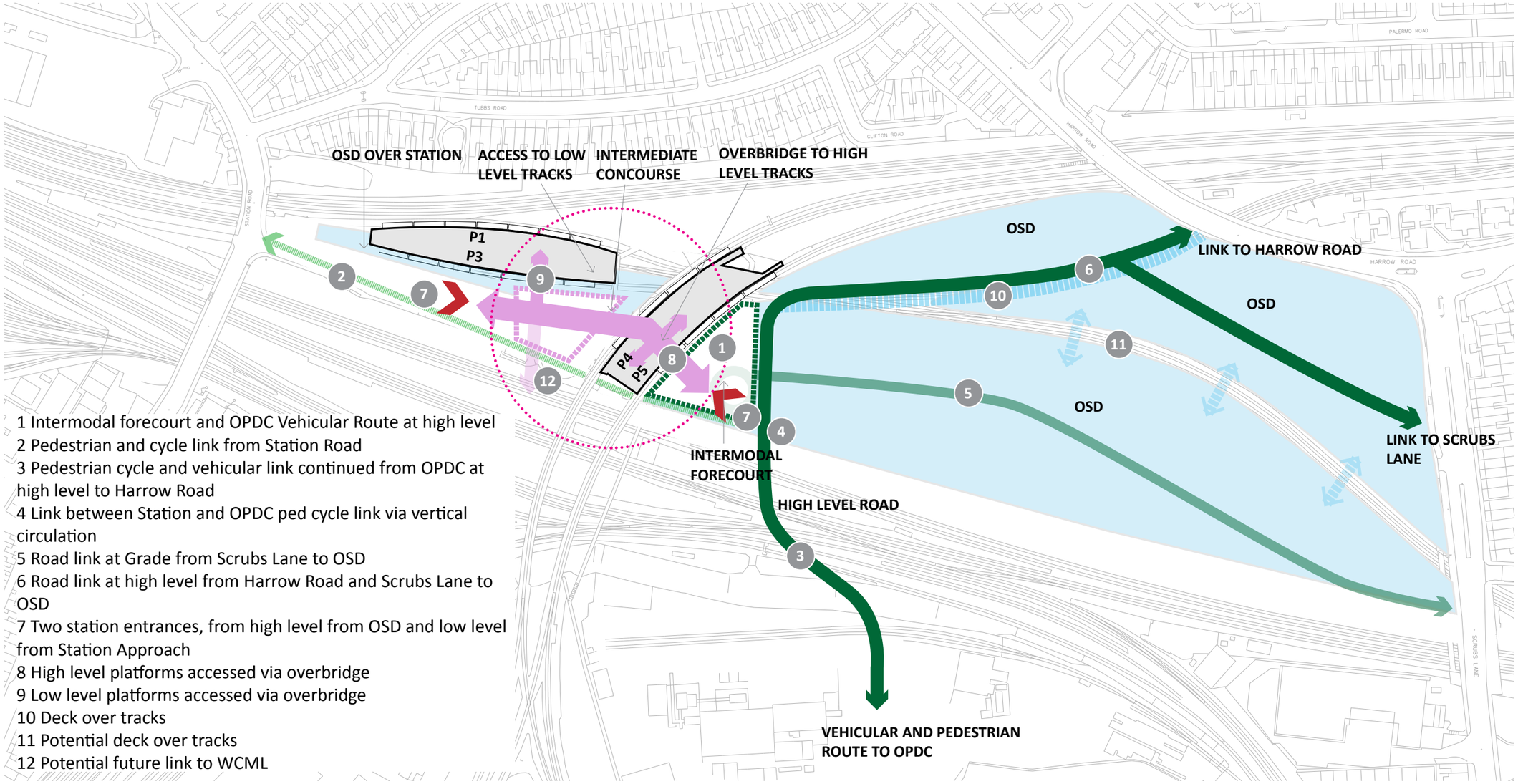
The environmental impacts of all three options are covered in Section 5.9.

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7.0 OPTION 3 - OFFSET OPTION

OFFSET OPTION

N



1 Intermodal forecourt and OPDC Vehicular Route at high level
2 Pedestrian and cycle link from Station Road
3 Pedestrian cycle and vehicular link continued from OPDC at high level to Harrow Road
4 Link between Station and OPDC ped cycle link via vertical circulation
5 Road link at Grade from Scrubs Lane to OSD
6 Road link at high level from Harrow Road and Scrubs Lane to OSD
7 Two station entrances, from high level from OSD and low level from Station Approach
8 High level platforms accessed via overbridge
9 Low level platforms accessed via overbridge
10 Deck over tracks
11 Potential deck over tracks
12 Potential future link to WCML

OSD SITES
PEDESTRIAN AND CYCLE LINKS
VEHICULAR LINKS
STATION ENTRANCE

7.0 OFFSET OPTION

7.1. DESCRIPTION OF SCHEME

The Offset Option concourse is located in Station Approach. An entrance and intermodal forecourt are relocated to the east side of the station at podium deck level within the proposed area of OSD.

A second entrance is located in Station Approach which continues to serves the existing local community of Harlesden.

Linking the two entrances is an overbridge which also connects to the HL platforms. A separate overbridge serves the LL platforms. Lifts and stairs provide access to the platforms.

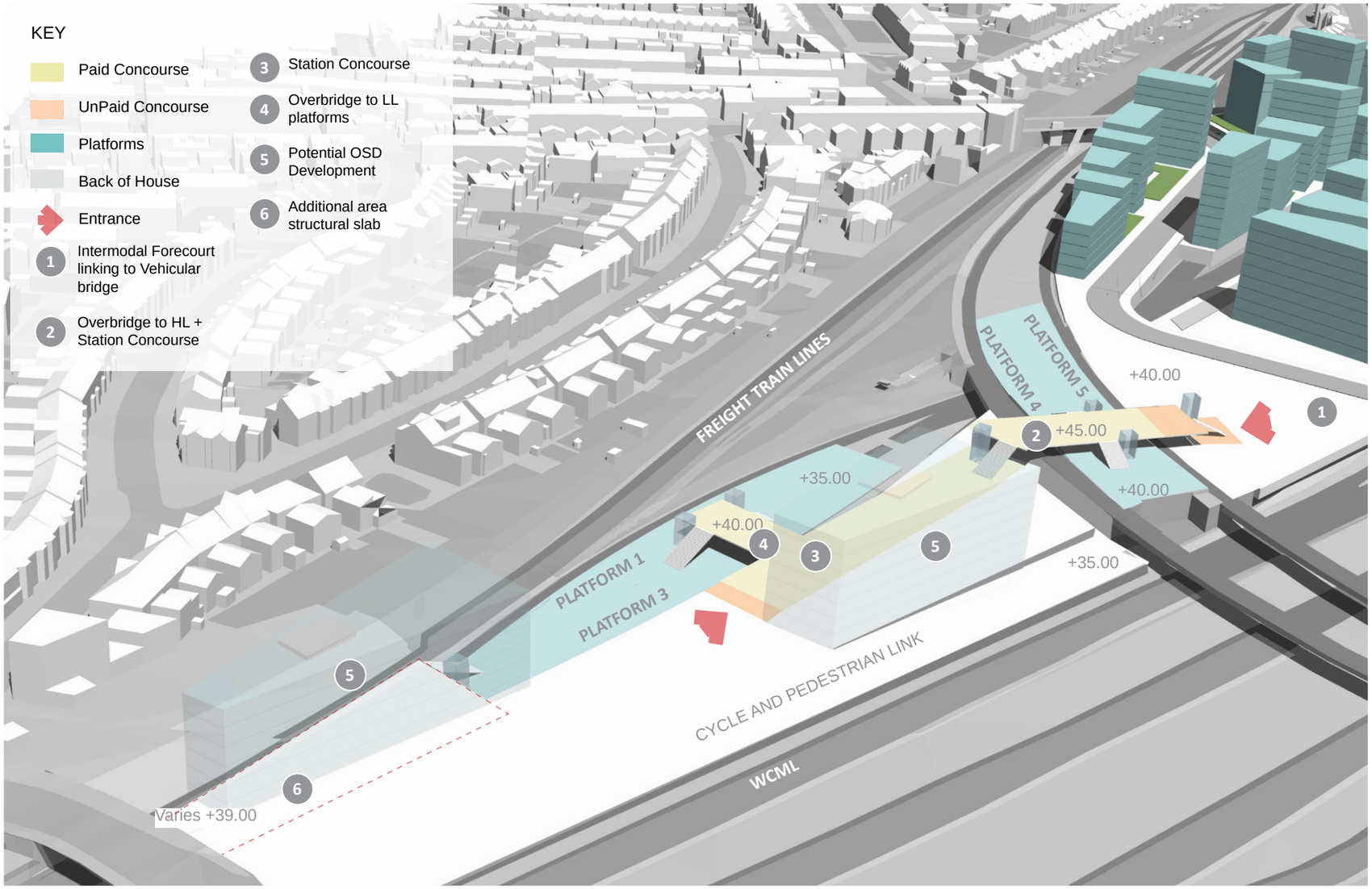
This option also provides greater potential for future connectivity with the WCML should Network Rail decide to reinstate the slow service platforms at Willesden junction.

A new road bridge across the WCML will provide north south connectivity for local buses, taxis and cycles linking Hythe Road station and OPDC development in the south to Willesden Junction and Harlesden beyond.

It is proposed that OSD be built on a podium deck at the same level as the intermodal forecourt.

Relocating the intermodal forecourt to the east side of the station will provide more opportunities for OSD in Station Approach. Active building frontages will animate the new urban realm and link the station entrance to the local community.

OSD on the eastern side of the station is the same as the Dual Option.



7.2. RAIL OPERATIONS

The Offset Option comprises different levels located either side of a central circulation area. This provides easy and wide access to the two separate platform islands, as well as easy evacuation into wide 'plaza-style' area. The station is staffed on both gate lines, located relatively close to one another and to station accommodation.

The Offset Option replicates the current operating arrangement and facilities. The current conditions are cramped, and the proposed 70sqm accommodation may not have capacity to accommodate any growth in train crew numbers due to enhanced service frequency. The accommodation is placed in or around the bridge over P4/5, therefore in easy reach of P1/3. There are no direct implications on train crew operations specific to each of the three options.

Passive provision has been provided for connection to any new platforms on the slow lines of the WCML that may be built (assumed TMD site will be vacated by this time). Consideration has been given to relocating the Up Slow Line platform opposite the existing Down Slow Line platform, to improve accessibility and connectivity between all platforms of the station. The existence of existing pedestrian/cycle link complicates access to/from any slow line platforms, unless main access is via a bridge between the piers of the NLL viaduct to the south of P4/5.

The critical mass of the station and main overbridge is further to the south of the site which lends to a shorter interchange between the main station and the WCML. The main overbridge from the concourse to P4/5 could be adapted to link to WCML. This option would provide access to all three sets of platforms from central concourse.

7.3. STATIONS OPERATIONS

7.3.1. Station Management

Despite being offset, support accommodation is consolidated in a similar manner to the Central Option. The offset concourse provides a marginally less direct route between the HL and LL platforms, but walking distances to all areas of the station remain low, making it easier for staff to manage the station.

Both the aforementioned improvements in usable platform areas and the offset intermediate concourse provide passenger waiting areas for the perturbed scenarios.

Separate routes into the HL and LL platform areas will provide operational flexibility to manage passenger flows independently and close off access if there is an operational incident.

7.3.2. Wayfinding

Passenger routes from the concourse to the platforms are particularly intuitive and easy for passengers to navigate, with very few changes of direction. (LL Platform - one level change two changes in direction, HL Platforms - two level changes one change in direction). Interchange passenger routes are also simple and direct.

7.3.3. Step Free Access

Accessible lifts are provided at both station entrances and PRM travel distances are relatively short. However, due to the intermediate concourse, interchanging between the LL and HL platforms would require 3 lifts, as opposed to just 2 in the Dual Option. Fewer lifts would, however, be required to get to HL from Station Road than the Dual Option.

7.4. FIRE AND EMERGENCY MANAGEMENT

7.4.1. Means of Escape

7.4.1.1 Platforms 1 and 3

Egress from the centre of the proposed P1/3 will be via the stairs leading to the proposed new lower overbridge, with an additional egress to the west of this platform via stairs to public realm.

With two of the three proposed exits routes being towards the centre of this platform, there is approximately 26m from the north of this platform to the platform exits. Dead-ends are not permitted when following the guidance of RSPG. As this dead-end length is only slightly more than the length of a train carriage, and considering the width of this platform (approximately 20m), this dead-end condition may be deemed acceptable by the regulator.

This platform length is approximately 130m, with the distance between exits being approximately 60m. Following the guidance of RSPG, exits should be positioned "with a travel distance of not more than 90m between any two exits". As such, this recommendation of RSPG is addressed.

At a later design stage, the proposed exits will be assessed to ensure that they provide sufficient width to allow all occupants to clear the platforms and station building within the recommendations set out in the Network Rail Station Capacity Assessment Guidance.

7**.4.1.2. Platforms 4 and 5**

Egress from the centre and the south of the proposed P4/5 will be via stairs leading to the proposed new higher overbridge, with an additional egress to the north of this platform via stairs and an enclosed corridor to a public right of way.

With the three proposed exits routes, two on opposite ends of this platform, there is little more than 14m from the extremities of these platform to the platform exits. As such, this platform does not present any significant dead-ends, which are not permitted when following the guidance of RSPG.

Following the guidance of RSPG, exits should be positioned "with a travel distance of not more than 90m between any two exits". This platform length is approximately 110m, with the distance between exits being no greater than 45m. As such, this recommendation of RSPG is addressed.

At a later design stage, the proposed exits will be assessed to ensure that they provide sufficient width to allow all occupants to clear the platforms and station building within the recommendations set out in the Network Rail Station Capacity Assessment Guidance.

7.4.2. Egress for Persons of Reduced Mobility

The exit to the overbridge of P1/3 to the new concourse will be step free, via a lift, for the evacuation of Persons with Reduced Mobility (PRMs). This lift will be required to be configured as an evacuation lift. In the current design there is no provision of step free egress to the west of this platform. A plan should be put in place to ensure there is a procedure for the evacuation of PRM occupants from this end of the platform.

The exits to the south and the centre of P4/5 to the new overbridge will be step free, via lifts, for the evacuation of PRMs. These lifts will be required to be configured as evacuation lifts. In the current design there is no provision of step free egress to the north of this platform. A plan should be put in place to ensure there is a procedure for the evacuation of PRM occupants from this end of the platform.

The options for the evacuation of PRM occupants include:

- Providing, where practicable, step free escape routes directly to a place of safety.
- Providing lifts, configured as evacuation lifts.
- Use of evacuation chairs and/or powered stair climbers.

7.4.3. Fire-Fighter Access

With fire-fighter access to both platforms coming from either Station Approach or the new intermodal forecourt on the east, there is good access to the proposed concourse, the entire length of P1/3 and the south of P4/5. It should, however, be discussed with the relevant fire authority whether additional fire-fighter appliance access will be required to serve the platforms. A turning facility should be provided along Station Approach to ensure that any fire appliance will not be required to reverse for a distance greater than 20m.

7.4.4. Fire-Fighting Equipment (Fixed and Portable)

It is assumed that no dry mains are provided along the existing platforms and that dry mains will not be required for the proposed new platforms. This should be confirmed with the relevant fire authority. It should be ensured that access to a fire hydrant is available within 90m from the entrance to the station building.

The type and location of portable fire-fighting equipment should be determined by means of a fire risk assessment and should be in accordance with BS 5306 Part 8.

7.4.5. Fire Detection and Alarm

RSPG B-2 recommends that an electrical fire alarm should be provided which is capable of manual operation by the public or staff. To comply with this, the station building will be provided throughout with a manual alarm system. This will include the provision of manual call points on the platforms.

A survey of the existing station building will be required in order to determine the current fire detection and alarm provision and to establish how this will be interfaced with the proposed system.

Automatic fire detection will be provided in all lift shafts.

7.4.6. Fire Suppression Systems

Suppression systems for life safety purposes are not required in the Building Regulations, however RSPG B-2 does recommend the use of suppression systems in machine and plant rooms. There may be potential to omit this requirement for the use of suppression systems as Willesden Junction Station is a surface station and the plant rooms will provide minimal risk to life safety. This will be required to be discussed with and agreed by all relevant stakeholders.

7.4.7. Fire Ventilation and Pressurisation Systems

As the proposed new platforms are in the open air, there is no requirement for any ventilation or pressurisation.

7.4.8. Fire Separation, Compartmentation and Structural Fire Protection

Any accommodation on the proposed new platforms will be provided with smoke containment in the form of compartmentation in compliance with RSPG B-2.

Structural fire resistance will follow the prescriptive guidance of Approved Document B.

7.4.9. Control of the Reaction-to-Fire Properties of Materials

The presence of combustible materials on the proposed new platforms will be limited to ensure that any outbreak of fire will be unlikely to develop to a significant size.

7.4.10. Fire Safety Signage

Fire safety signage will be provided throughout to comply with BS 5499.

7.4.11. Emergency Lighting

Emergency lighting will be provided to the stairs, PRM lift and along all escape routes in compliance with BS 5266.

7.4.12. Conclusion

- Neither of the two platforms in this option present any significant dead-ends, which are not permitted when following the guidance of RSPG.
- Despite the recommended maximum distance of 90m between exits being exceeded by approximately 20m on P1/3, it is expected that this will be deemed acceptable by the regulators as this platform is in open air and there are no dead-end conditions.
- There is no provision of step free egress from the west of P1/3 or the south of P4/5.
- Access is provided to the centre extent of P1/3 via stairs from the proposed new lower footbridge. Access to P4/5 is provided from the higher overbridge linking the pedestrian forecourt and the lower footbridge. Stairs from this footbridge provide access to the centre and south of P4/5.
- Escape stairs are provided to both platforms, from the west of P1/3, leading upwards to grade level and stairs from the north of P4/5, leading downwards to grade level.

On completion of the proposed works, the new platforms will be compliant with the guidance set out in Approved Document B 2010 edition, the Railway Safety Principles and Guidance and the British Standards.

7.5. URBAN REALM

7.5.1. Option Overview

This option for the redevelopment of the station would be accessed from two new entrances, one on what is currently Station Approach and a second new entrance on the eastern side. The two entrances would take passengers into a new linear concourse, which would provide space for ticketing and waiting.

The existing interchange for buses and vehicles on Station Approach would move to the east side, with some enhancement of planting and a new forecourt on both sides. The east and west would be equal entrances with station facilities shared between them on the linear concourse.

There is also potential to move the western entrance further along Station Approach to gain some of the benefits of the Dual Option which this is currently missing.

7.5.2. Impacts

7.5.2.1. Efficiency

Similar to the Dual Option this option would be highly beneficial for interchange as it would move to a new custom-designed space on the eastern side. Limited drop-off and bus facilities could still be retained on the west. The new interchange space on the east would be efficient as it is in direct line of sight to the new eastern entrance and will allow people to get to other modes far more easily than they can currently.

7.5.2.2. Legibility

The new western entrance would improve legibility as it is visible from Station Road, although it could be more closely aligned to the Dual Option to be even more beneficial. The new eastern entrance, which would face onto a new local highway network, is also a great improvement over the existing situation on the east.

7.5.2.3. Permeability

In this option there will be an east-west route provided for cyclists and pedestrians using the existing low level vehicle access from Station Approach. This will provide an unpaid route, as recommended in the PLACE review and improve permeability over the existing situation. There will then be two new entrances provided to the station which makes it less permeable that the current station in terms of access points, but the legibility of these will be improved so wayfinding will be improved as a whole. Unlike the other options the internal movement route could also potentially accommodate an unpaid internal link and the central ticket hall makes for a particularly usable and permeable design solution.

7.5.2.4. Sense of Place

The improved legibility of the entrances will enhance the overall sense of place at the station. Having a strong and visible street presence is an important factor in sense of place. For people in the vicinity, the building and associated public spaces will be recognisable and easily identified both at day and night. The linear concourse will also help with sense of place as it will be visible from the entrances. The opportunities for high quality public realm at both entrances, with identifiable station forecourts, will help to integrate the station into the wider urban fabric.

7.5.2.5. Townscape

As well as helping with sense of place, the new forecourts at both the west and east and the visible entrances provide an opportunity to deliver a strong piece of new townscape which integrates active frontages, mixed uses and activates a vibrant street scape. On the West this is not as great as in the Dual Option, but through further design refinement it can be improved. While Harrow Road is currently the main street frontage on the east, the opportunities here for OSD mean that a new area of townscape can be created for the station to sit within. There are still more limited opportunities for OSD on the west side, but they are greater than in other options, so the ancillary benefits of providing a new and enhanced townscape through development could be realised.

7.5.2.6. Accessibility

The new entrances would both provide step-free access to the station and the design of the western entrance could be designed in such a way that avoids the issues of the steep slope on that side. The station would still be over split

levels and while lifts / escalators could be provided, it is still likely to be complicated for the disabled, elderly and families with young children or luggage. The unpaid link under the tracks between east and west sides negotiates a significant change in level. A ramp is envisaged to tackle this height difference, the arrangement of which will be developed at the next design stage.

7.5.2.7. Community

The opportunities to enhance a sense of community through this station option are more balanced between the eastern and western sides as both will have new forecourt spaces that could provide a space for events and markets etc. The interchange area on the west and slope of Station Approach limits the space and usability. As a whole, the option is an improvement over the existing situation, but it still has limitations, such as compromised bus access on the west. However, the environment around the interchange will be enhanced through planting, making it a nicer area for people to use.

7.5.2.8. Economy

Similar to the Dual Option, this option provides good opportunities for OSD and development to both the east and west of the Station, as the primary area for interchange has been relocated away from Station Approach. The potential for activating the station forecourt are to be explored further, as there is plenty of room for commercial uses which could be used to activate the streets and frontages.

7.5.3. Conclusion

- Provision of new western entrance on Station Approach, with new concourse running parallel to existing P1/3.
- Bus interchange relocated to eastern side, as part of new east entrance and forecourt.
- Linear concourse makes a legible interchange, and location to south provides future access to WCML platforms.
- Greater opportunities for development on western side over other options.

This option brings multiple benefits over the existing station and performs better than the Central and Dual. With further refinements to the entrance location on the west to make it more aligned to the Dual Option, this could be enhanced even further, as it could have a strengthened presence on Station Road. Moving the primary interchange facilities to the east allows the new intermodal forecourt to be constructed whilst the existing remains in use, resulting in less disruption to station use. However, it also means that people can drop off at the west, and this could be important to serve businesses in the Park Royal area. It is a more balanced solution, sharing many of the benefits offered by both the Central and Dual Options.

Looking to the longer term, this option is also most easily adapted to provide future access to platforms on the WCML, should they be added, as the central focus of the station – the linear concourse – is further south than in other options. In this scenario it would create a new central concourse space to serve all platforms, which would be roughly equidistant from the concourse. There is also greater scope to deliver jobs and homes as part of the station development, particularly on the west side of the station, than in other options.

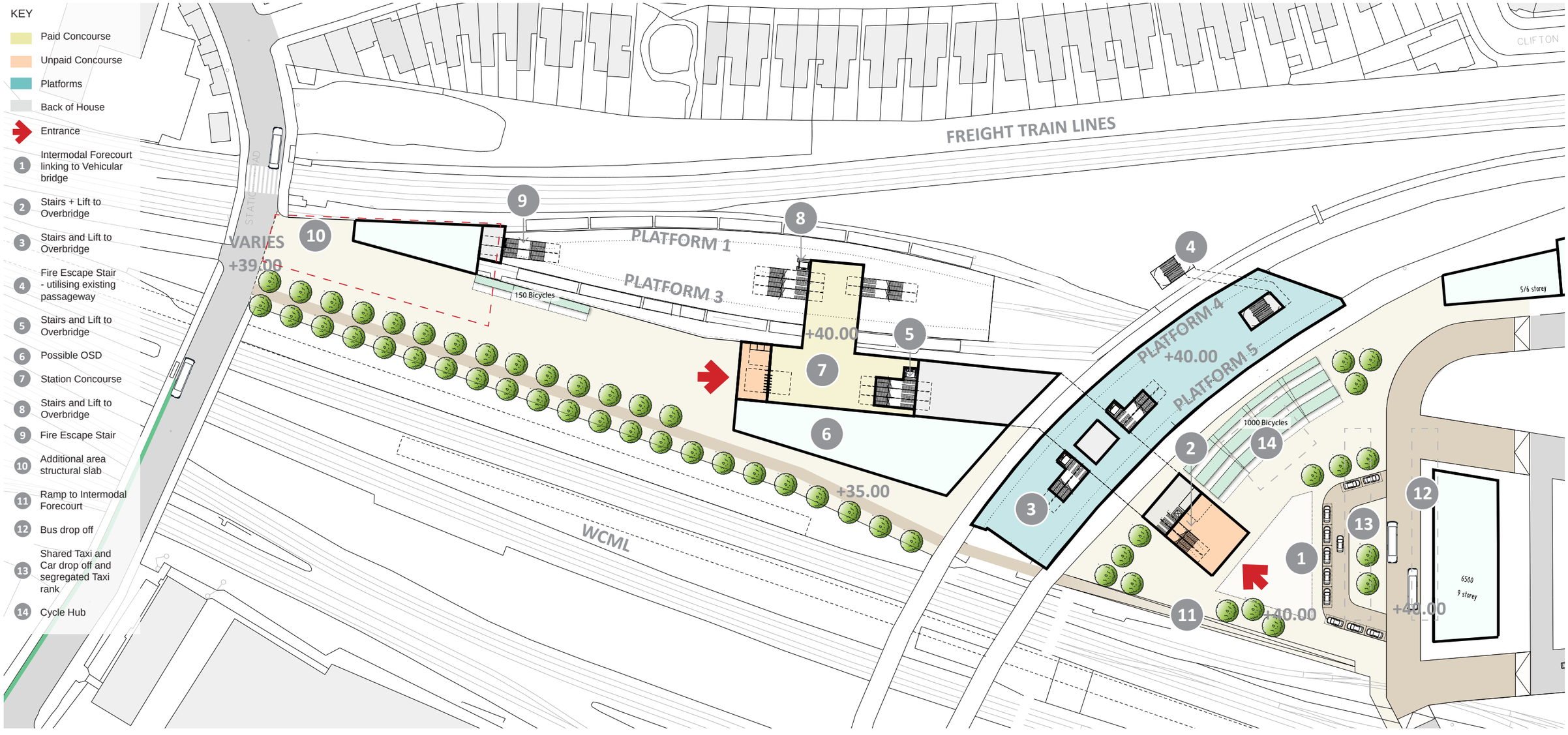
7.6. TRANSPORT PLANNING

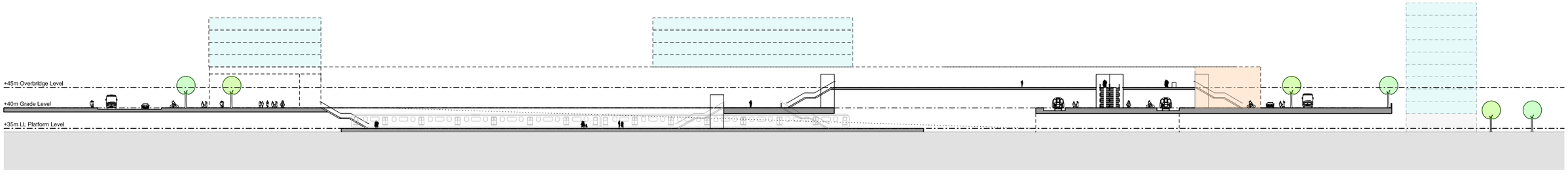
In terms of connectivity and intermodal interchange, this option is essentially the same as the Dual Option, so the same comments apply. The only difference is that the proposed Station Approach entrance to the station is close to the current entrance location and is therefore slightly further from Station Road and the passenger catchment to the north in Harlesden than the Dual Option. This will mean it is marginally less convenient for users within this catchment than the Dual Option.

- Intermodal interchange on the east side of station adjacent to OSD and OPDC vehicular route at high level.
- Pedestrian and cycle links from Station Road and from OPDC at high level.
- Link between Station Road and OPDC pedestrian/cycle link via vertical circulation.
- Road links from Scrubs Lane to OSD and at high level from Harrow Road to OSD.
- High level vehicular link from OPDC over WCML.
- Two station entrances - high level from east and low level from Station Approach.
- Pedestrian and cycle connectivity provided between OPDC, Willesden Junction, Harlesden and Harrow Road/Scrubs Lane.
- Significant opportunity to provide improved bus connectivity over WCML between Harlesden, Harrow Road/Scrubs Lane and OPDC via Willesden Junction.
- The larger interchange area is likely to allow for significantly enhanced interchange facilities, although bus interchange would be split between the east and west ‘forecourts’.
- Potential for unpaid pedestrian link through station.

KEY

- Paid Concourse
- Unpaid Concourse
- Platforms
- Back of House
- Entrance
- 1 Intermodal Forecourt linking to Vehicular bridge
- 2 Stairs + Lift to Overbridge
- 3 Stairs and Lift to Overbridge
- 4 Fire Escape Stair - utilising existing passageway
- 5 Stairs and Lift to Overbridge
- 6 Possible OSD
- 7 Station Concourse
- 8 Stairs and Lift to Overbridge
- 9 Fire Escape Stair
- 10 Additional area structural slab
- 11 Ramp to Intermodal Forecourt
- 12 Bus drop off
- 13 Shared Taxi and Car drop off and segregated Taxi rank
- 14 Cycle Hub





7.7. STATION PERFORMANCE – DYNAMIC PASSENGER ANALYSIS

In line with Section 4.3, 70% of exits/entries to the station are assumed to occur at the intermodal forecourt, i.e. for this option to the east (Harrow Road/A404).

7.7.1. AM Results

Platforms 1 and 3 and Station Approach Ticket Hall/Concourse

Figure 10.7.1 shows the CMD Map for P1/3 for the 15 minute peak. P1 shows the most congestion at LOS C/D, P3 suffers minor congestion at B/C. Based on this it is evident the platforms are therefore able to cope with the peak demand during the AM. The entrance to the stairs on both sides of the platform are at LOS C (some LOS D) which shows they provide adequate vertical circulation and platform egress/access.

Figure 10.7.2 shows the CHD Map for P1/3 for the 15 minute peak. During this time, P1 shows sustained congestion (above LOS C) up to 5 minutes. The remaining areas experience LOS C for up to 2.5 minutes. The vertical circulation are subject to only brief times of congestion (above LOS C). Due to the high boarding demand, P1 is more congested than P3 for this period.

Platforms 4 and 5, Overbridge and Harrow Road Ticket Hall

Figures 10.7.3 shows the CMD Map for P4-5, Station Approach/Harrow Road Ticket Halls and the concourse/overbridge for the 15 minute peak. The access stairs for P4/5 on the overbridge are overall LOS C on both sides. More congestion occurs at the base of the north-east stairs due to their location of the stairs relative to the platform. P4 and P5 are mostly LOS B/C and show that they are able to accommodate the AM peak demand. Vertical circulation is sufficient throughout the rest of the station. Both ticket halls are able to process the entry and exit demand during this peak.

Figure 10.7.4 shows the CHD Map for the same areas as in Figure 10.7.3. The results of this show that the Station Approach Ticket Hall (to the west) is the only area that experiences any sustained congestion. The rest of the station is able to cope with the demand very well.

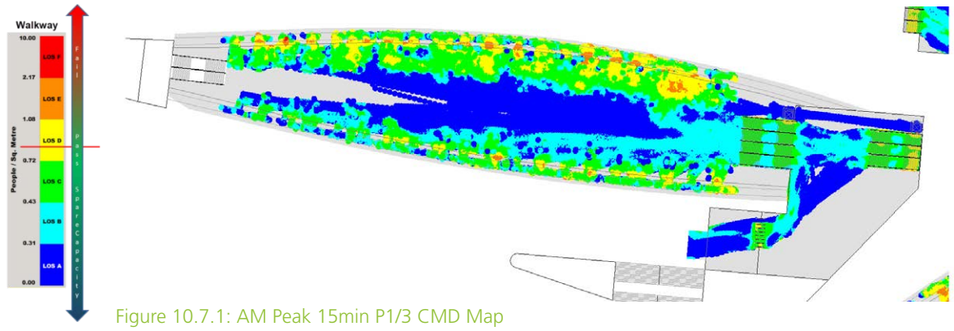


Figure 10.7.1: AM Peak 15min P1/3 CMD Map

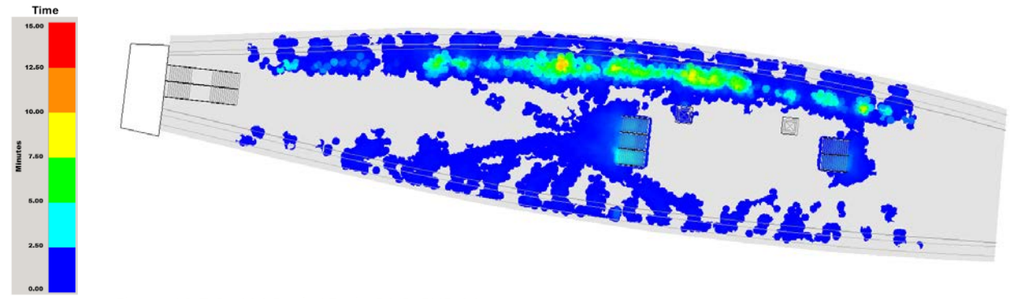


Figure 10.7.2: AM Peak 15min P1/3 CHD Map

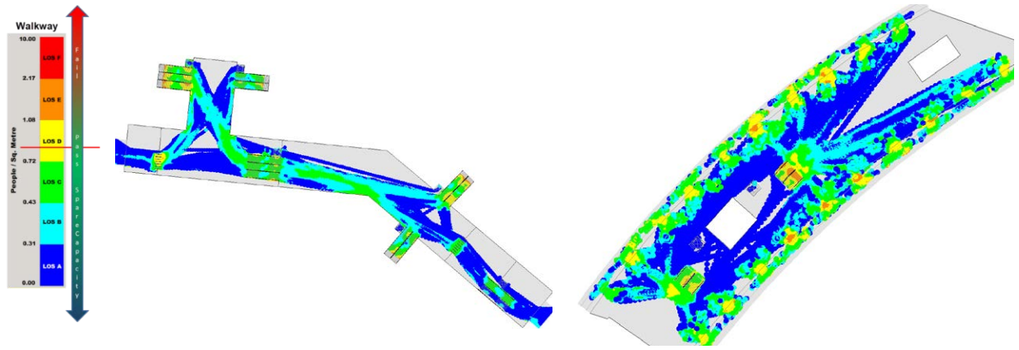


Figure 10.7.3: AM Peak 15min P4/5, Concourse/Overbridge and Ticket Halls CMD Map

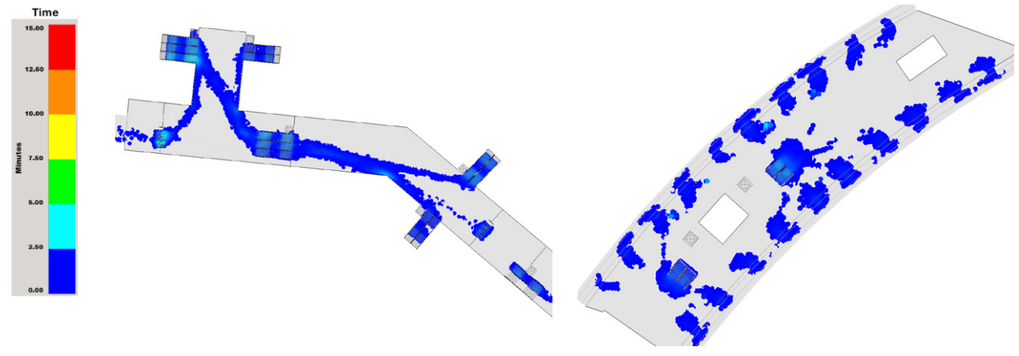


Figure 10.7.4: AM Peak 15min P4/5, Concourse/Overbridge and Ticket Halls CHD Map

7.7.2. PM Results

Platforms 1 and 3 and Old Oak Ticket Hall/ Concourse

During PM, P3 is the worst affected. Figure 10.7.5 shows the CMD Map for P1/3 for the 15 minute peak. During the PM, P3 is severely congested at LOS D/E and some F, while levels on P1 are generally acceptable. Congestion on P3 affects the stairs located in the centre of the platform, due to their more centralised position these see much higher use than those located at the east end of the platform, revising the location of these is suggested.

During the PM, the CHD map in Figure 10.7.6 shows highlights the amount of congestion on P3 which experiences levels above LOS C for up to 10 minutes. Levels on P1 are again, generally acceptable. The sustained congestion on P3 affects the stairs located in the centre of the platform.

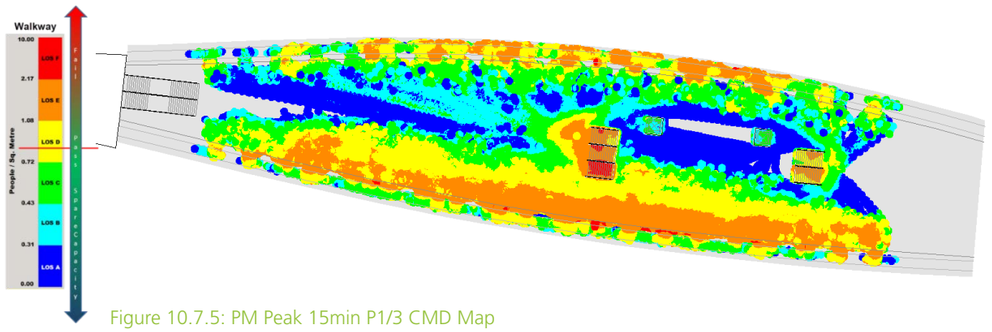


Figure 10.7.5: PM Peak 15min P1/3 CMD Map

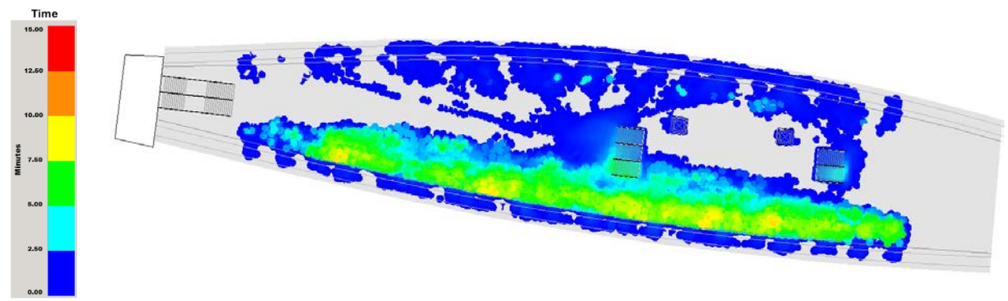


Figure 10.7.6: PM Peak 15min P1/3 CHD Map

Platforms 4 and 5, Overbridge and Harrow Road Ticket Hall

Access to/from both entrances and the overbridge are at acceptable levels, but the lower concourse suffers from congestion at the passageway access to p1/3 from the overbridge stairs which exhibit LOS D/E. This is due to the high amount of interchangers during this period. The LOS for access stairs on the overbridge to P4/5 stay within acceptable levels. On the platform itself, the stairs however suffer from severe congestion. Both stairs see large areas at LOS F and surrounding areas LOS E on the platform. The ticket halls and overbridge are at acceptable levels.

All areas are above LOS C for up to 2.5 minutes, while the access passage way to P1/3 stairs and access to Overbridge from lower concourse see more sustained congestion (up to 5 minutes). As with the previous figure it is evident that both sets of stairs on P4/5 see much more sustained congestion. Both platforms are LOS C for up to 2.5 minutes with some localised areas up to 5 minutes showing that these are generally able to cope with demand. As before, both ticket halls and gatelines see little congestion during this peak period.

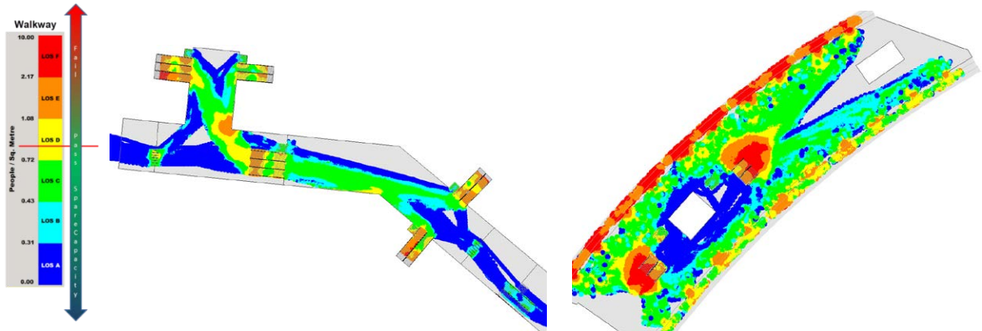


Figure 10.7.7: PM Peak 15min P4/5, Concourse/Overbridge and Ticket Halls CMD Map

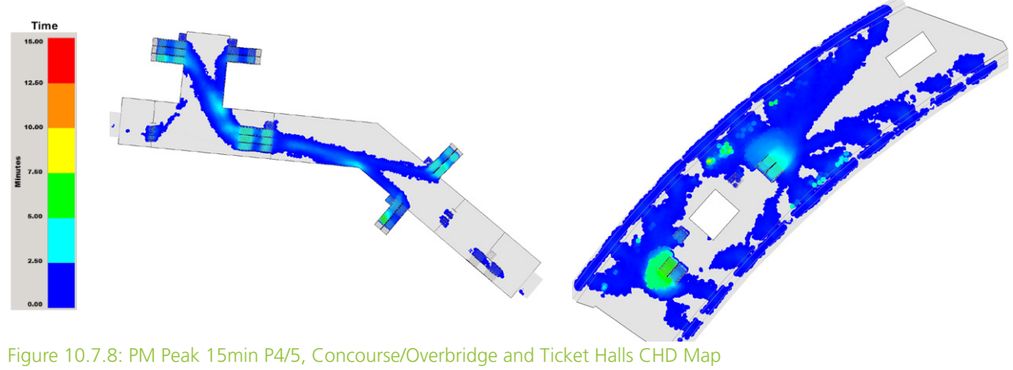


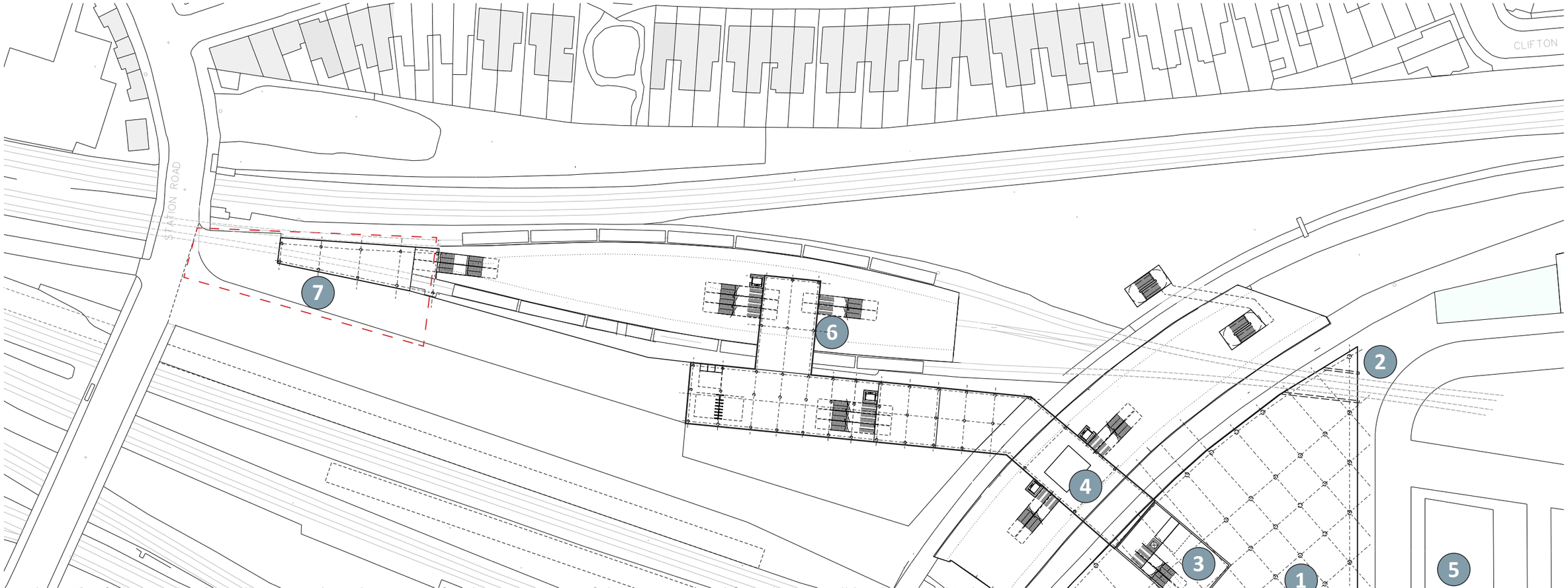
Figure 10.7.8: PM Peak 15min P4/5, Concourse/Overbridge and Ticket Halls CHD Map

7.7.3. Conclusions

- During the AM peak the station operates reasonably well, during the PM peak period vertical circulation is insufficient and this creates congestion.
- High densities are apparent around the vertical circulation providing access to P4/5 and this affects clearance times on the platform.
- Vertical circulation landings between the concourse and overbridge levels are congested as well as from both the east and west access stairs to P1/3, large crossflows occur within space creating added congestion.
- Large amounts of space is underutilised on the overbridge this could be used for retail or as a designated dwell area during disruption.

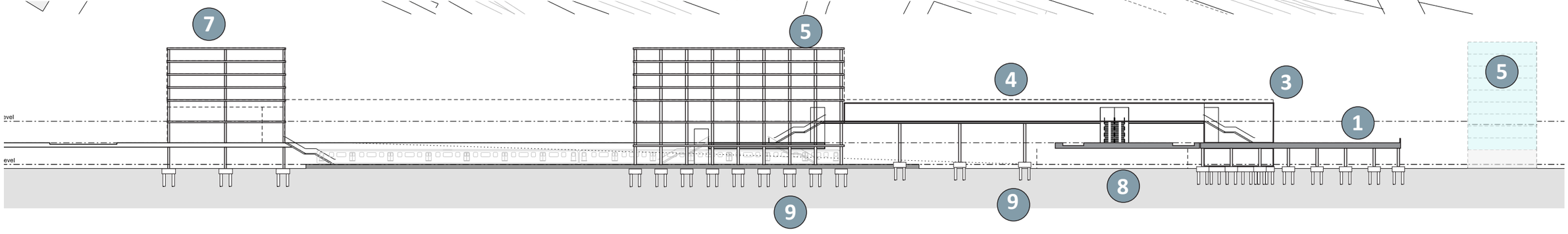
7.7.4. Recommendations Summary

- Revise positioning/provision of vertical circulation for P1/3 and P4/5 so that utilisation is more evenly distributed for platform access/egress.
- There is a potential rationalisation of deck underutilised space, this could potentially be used as a dwell area, for retail units or back of house facilities.
- Sensitivity testing for changes to future tph as well as more thorough platform-train interface modelling such as line load and train capacity modelling.
- Varying scenarios tested to assess station operation resilience such as standard escalator maintenance, demand surging, service disruptions and emergency evacuations.
- Recommend modelling of the initial construction phasing to mitigate impacts and ensure the station is kept operational.
- Widen the lower landing for vertical circulations on concourse to overbridge to alleviate congestion, additionally the passageway access size and/ or visibility/angle of incidence between p1/3 and concourse should be revised.



Loading: The following loading allowances have been used for the assessment of the structure and foundations. All loads quoted in kN/m2

	Pedestrian entrance	Overbridge	Overbridge	OSD structures		
			LU entrance	Retail	Office	Residential
Live Load	10	10	10	10	5	1.5
Superimposed load	10	4	5.0	5.0	2.0	1
Construction	300mm RC slab on 750 deep beams on columns on 8x10 grid	Steel bridge structures with lightweight RC slab on profiled metal decking	Braced steel frame (approx. 7.5 x 10m grid) supporting 2000mm lightweight concrete slab on profiled metal decking.	Braced steel frame (approx. 7.5 x 10m grid) supporting 130mm lightweight concrete slab on profiled metal decking		



7.8. CIVIL AND STRUCTURES

7.8.1. Features

The primary structural and civil works that feature in the Offset Option can be summarised as follows:

- A new intermediate concourse and entrance building is built in the existing forecourt area
- A new interchange overbridge is constructed over P4/5, above existing railway infrastructure.
- There is a new elevated intermodal forecourt built to the east with vehicular, pedestrian and cycle access.
- A new vehicular bridge link towards OPDC is constructed.
- A relatively small area of OSD is constructed above the station.

7.8.2. Structural Strategy

The diagram opposite shows the structural arrangement for the Offset Option. Here the entrance and interchange concourse is offset to the south of the eastern end of the Bakerloo Line platforms. This reduces the amount of construction over the LU tracks and so has the potential to cause less disruption to the operational LU station than the previous schemes, Note, however, that there will be construction over the LU tracks at the other end of the Bakerloo Line platforms for the emergency escape access route at the western end of the station.

The following notes relate to the annotation on the diagram.

1. Suspended reinforced concrete slab at elevated track level for new intermodal forecourt,. The slab is supported on RC columns founded on pilecaps at ground level. There is a ramp to the south of the slab (also in reinforced concrete) which can provide pedestrian or cycle access from Station Approach to the intermodal forecourt.
2. The Bakerloo Line tracks pass under the slab, so walls are constructed either side with a suitable offset to facilitate construction. Slab over is built with permanent formwork panels to minimise possession time required.
3. Station entrance structure is shown as a RC box construction founded on a piled raft at existing ground level. The entrance box structure stabilises forecourt slab which is otherwise independent of the surrounding structures. The station entrance box supports the east end of the overbridge structure. Access to the forecourt slab will also be provided via new bridge and slab structures to the south and east – these are outside the scope of this study.
4. Lightweight steel overbridge structure spanning over the NLL tracks to supports in the centre of the HL platform. The overbridge is a single-storey lightweight structure founded on pad foundations on the existing platform, which will be assessed for this additional load. Note that the Bakerloo Line tracks pass under the HL platform in the vicinity of the overbridge foundations.
5. Adjacent commercial development (outside scope of this study)
6. Station entrance and interchange structures with OSD in steel with lightweight concrete floor slabs on profiled metal decking, with braced bays arranged to fit around stair and lift cores. Steel columns are founded on pilecaps at existing ground level. The OSD is built over the station entrance only (i.e. not over the tracks) on a 10m x 8m grid. The access to the Bakerloo Line platforms is in a lightweight single storey bridge structure, spanning over the eastbound tracks.
7. Emergency escape stairs with OSD over spanning over the eastbound Bakerloo Line, onto a line of columns between the two tracks. Edge of the building to be brought south to avoid clashing with the westbound Bakerloo Line. The building is narrow and will have a moment-frame structure – there is no space for bracing as the frame spans over the track. Piled foundations will be installed from the existing platform level. This is a constrained site and the number of storeys over will be limited.
8. Existing station structure remains as is, with supports for the lightweight overbridge to bear on the existing island platform.
9. Piled foundations under each column location. Allow for pilecaps supported on pairs of 750mm diameter CFA piles, 25-30m long at each column location.

7.8.3. Relative Merits and Challenges

The location of the new western entrance and intermediate concourse avoids the need to span over the Bakerloo Line tracks and can be constructed relatively easily due to better access and fewer restrictions.

While the overbridge is constructed over P4 and P5, it is not also constructed above the Bakerloo Line rails as in the Central and Dual Options and so will be relatively easy to construct. Additionally, although this option is shown with P2 removed from service and filled in, it would be relatively easy to adapt the vertical circulation to drop down on either side of P2 if it was required to be retained. Furthermore, construction may proceed prior to the Willesden TMD being relocated.

As per the Dual Option, the new elevated intermediate forecourt constructed to the east of the station is more substantial than in the Central Option. Similarly, construction of the vehicular link bridge at an early stage could be used to help improve access to this confined area of the site prior to the removal of the TMD. The programme could potentially be reduced as a result.

Also similar to the Dual Option, the link bridge constructed towards the south in this option must accommodate vehicles. It will therefore be more substantial and challenging to construct than in the Central Option.

The area of OSD provided above the station is similar to the Central Option. However, in this option, the intermodal forecourt is moved to the east of the station, freeing up a much greater worksite area. Enabling works for the OSD such as foundations could be delivered at the same time as the construction of the new western entrance.

7.9 ENVIRONMENT AND CONSENTS

The environmental impacts of all three options are covered in Section 5.9.

ATKINS WestonWilliamson+Partners

8.0 STAKEHOLDER CONSULTATION AND OPDC PLACE REVIEW

8.1. STAKEHOLDER WORKSHOP

A client and stakeholder workshop was held to review the three options. During this workshop, key differentiators were discussed and the designs were scored against previously agreed project criteria.

The stakeholder group included representatives of the following organisations:

TfL

- Transport Planning
- Rail and Underground Transport Planning
- Borough Planning
- Major Programmes Sponsorship

OPDC

- Transport Planning
- Planning
- Design

London Borough of Brent

- Transport Planning
- Urban Design

Network Rail

- Station Capacity
- London North West
- Anglia Route

London Borough of Hammersmith and Fulham

The option assessment used a sifting evaluation against the criteria shown below:

Station use (operations during final completion)

- Wayfinding
- Station Management
- PRM Routes
- Fire
- Key Demand Routes

Intermodal Interchange

- Ease of interchange
- Proximity of major modes
- Cycle facilities
- Wider OPDC transport modes
- Safeguards potential for WCML stopping

Public Realm Integration

- Enhanced Street Presence
- Enhances Sense of Place
- Integrates with OPDC Masterplan
- Connectivity to Harlesden

Rail Operations

- Impact (in operation) on rail operation and maintenance
- Impact (during construction) on rail operation and maintenance

The relevant members of the design team presented to the client and the wider stakeholder team, with analysis of these criteria. The options were then assessed to a score out of 5 by a consensus vote reached by all members of the workshop following discussion.

The following scoring system was adopted:

1. **Significant issue(s)** e.g. major concession required
2. Some concession(s) required – **Average**
3. **Viable solution** without significant concession
4. **Good solution** that will need a bit more work
5. The **best option** being considered

Marking for the options ranged from 1 (e.g. for Dual Option Rail Operations) to 4 (e.g. for Offset Option Station in Use and Public Realm).

This broad split of marking allowed for a robust assessment of each option. A weighting proportion was not considered as this would have added an unnecessary level of complexity to the assessment.

Option performance

The scoring indicated that – in an unweighted summation – the Offset Option scored strongest, followed by the Central Option and then the Dual Option.

- For Station Use (operations during final completion) both the Central and Offset Options scored well.
- All options were felt to have the potential to be designed to function well for Intermodal Interchange and were all scored as viable. Further details on the intermodal provisions should be developed at the next design stage.
- The Offset and Dual Options scored well for Public Realm Potential.
- The Offset Option scored highly for Rail Operations, with the Dual Option considered to have 'significant issues'.

		Option 1 Central		Option 2 Dual		Option 3 Offset	
Criteria		Score	Descriptor	Choice	Score	Choice	Score
1	Station in Use	4	Good Solution	2	Average	4	Good Solution
2	Intermodal Interchange	3	Viable Solution	3	Viable Solution	3	Viable Solution
3	Public Realm Potential	2	Average	3	Viable Solution	4	Good Solution
4	Rail Operations	2	Average	1	Significant Issues	4	Good Solution

8.2. HARLESDEN TOWN CENTRE FORUM

The three options were presented to Harlesden Town Centre Forum on 19th September 2016 and the following comments were received:

Western entrance

- In the Central Option the west entrance is a long way from the street.
- Questioned whether a third entrance could be included in the Central Option on Station Road.
- This is a longer walk to the low level platforms from Harlesden town centre compared to today, which is a disadvantage.
- Having the entrance on Station Road means passengers won't feel they are walking around the back of the development to access the station.
- Concern that the Station Road entrance/ exit could be seen as the 'back entrance.' Important to ensure this exit/entrance point is of a high quality design. Suggested it includes retail development to draw people to it and create a link with Harlesden Town Centre.
- Keen for a drop off point to remain on Station Approach but not necessarily the whole intermodal interchange.

Link to town centre

- A good connection with the town centre from the western entrance is required which provides:
  - An unbroken pedestrian link
  - Active frontages
- The pedestrian/cycle link between Harlesden town centre and Old Oak Common is likely to work better in the Dual and Offset Options than in the Central Option which retains vehicular access to Station Approach.

Eastern entrance

- It is a long way to Harlesden town centre via Harrow Road compared to the western entrance so this would be mainly used by people from the south and east or from Scrubs Lane.

Station internal movements

- Concerns over passengers entering the station from the west having to walk along the low level platforms to access the high level platforms in the Dual Option.
- Can a secondary entrance be provided further down Station Approach to access the high level platforms?
- Or can a high level concourse or walking route be provided along the length of the low level platforms to avoid conflicts with passengers on the platforms.

Station layout

- Mixed views on moving the low level platforms east – only appropriate if something worthwhile is put in their place, and this could extend the distance to Harlesden town centre (Note: this is a scenario with the 5th Studio Connectivity Study, not currently adopted within the GRIP 2 study).

Public realm/architecture

- Seen as very important – it needs to be attractive to users for it to be well used and effective.
- Differentiating the east and west sides of the station is seen as beneficial – e.g. if one side has standard chain retail/cafés and the other side more of a market feel.
- The station must be well integrated with the development – Bond Street was cited as a bad example, with High Street Kensington a good example.
- Which way the station faces is important – it must not feel like there is a front and a back entrance so it has to face both ways.
- Balance between facing west or east is not necessarily about on what side the intermodal forecourt sits.
- The need for the station to better link in to cycle routes and include cycle parking at both entrance/exit points. Concerns over security of existing cycle parking.
- Would like to see if more OSD could be accommodated to the west to facilitate development with an active frontage, which would create a stronger link to Harlesden.

Short term improvements

- Station Approach should be made more pedestrian friendly, with greater balance towards pedestrians.
- Safety improvements should be made at the junctions of Station Road with Station Approach and Tubbs Road.
- Staff use of the station drop-off/pick-up bays needs to be addressed.
- Too many activities are occurring in one space in Station Approach so the layout could be improved.
- The existing path to Harrow Road could be widened to make it a more comfortable journey for pedestrians.

The client and design team will ensure that these comments are incorporated into the design as it develops.

8.3. OPDC PLACE REVIEW PANEL

The design team presented the emerging three options to OPDC's PLACE (Planning, Landscape, Architecture, Conservation and Engineering) Review Panel on 3rd October 2016. The client team have advised that these comments will be incorporated and progressed as the design develops. Aspects covered by the panel are summarised below.

Movements and Entrances

- Further work to explore east-west connectivity.
- Consideration of three station entrances.
- Future proofing to support the Watford DC/ Bakerloo Line.
- Improvement to the east-west cycle and pedestrian routes.
- Location of the intermodal forecourt, particularly retention in Station Approach.

Public Realm and Oversite Development

- Avoiding the perception of a front or back entrance through developing a distinct character for each.
- Integrating the entrances into buildings.
- Further consideration of the eastern public realm and station integration within it.
- Exploration of heritage assets.
- Potential for a green buffer between the station and the community along Tubbs Road.

Phasing

- Phased delivery of the road adjacent to the eastern entrance.
- Pursuit of early benefits to existing residents, such as to the west of the station.

Architectural Ambition

- Consideration of townscape issues alongside operational issues.
- Consideration of an architectural language across all OPDC stations.

On the individual options, the panel suggested:

Central Option

- Inclusion of a third station entrance to the west fronting the Old Oak Lane.

Dual Option

- Additional consideration of the vehicular/taxi drop off.
- Heavily reliant on the bridge link to the south being delivered.
- Further consideration of the use and treatment of Station Approach is required.
- Exploration of an east-west unpaid pedestrian route.

Offset Option

- Inclusion of an east-west unpaid bridge connection.
- Potential for a stronger connection and mix of public realm along Station Approach, through buildings to activate this space.
- Consideration of a third entrance, from the Bakerloo Line to Old Oak Lane.

Whilst resolution of these comments is anticipated at the next design phase, the design team noted briefly on two comments which recur:

- "Third Entrance"

  The panel expressed a desire to see a third entrance directly on Station Approach/ Station Road presenting a direct entrance to Willesden. Issues regarding station operation would need to be investigated regarding this, and whilst some could be overcome (such as the management of a three entrance station) others, such as the congestion occurring on P1/3 with a 'through route' from Station Approach/Station Road which are highlighted within the dynamic modelling of the 'Dual' option, would be harder to overcome.

- Potential to add a route to the overbridges over the High Level Platforms.

  The panel suggested that the team should consider addition of an unpaid route alongside the 'paid' route which would provide an east-west pedestrian link across the study area. In principle this could be accommodated by a widening of the overbridges and review of the gateline positions and/or additional vertical circulation. The team would wish to investigate this in more detail to determine if a practical and legible route could be achieved as an 'integrated' solution rather than a 'bolt on' addition.

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9.0 SUMMARY AND NEXT STEPS



Station Approach, Option 3 – Offset Option

9.0 SUMMARY AND NEXT STEPS

9.1. SUMMARY OF FINDINGS

Willesden Junction Station will be subject to significant increase in passenger demand by 2041 from new transport infrastructure and large scale development associated with the Old Oak and Park Royal Opportunity Area. Demand analysis for the 2041 `worst case' scenario predicts that passenger numbers will more than double the current demand, by a factor of 2.23 in the AM peak and 2.76 in the PM peak.

TfL, OPDC and the London Borough of Brent commissioned a GRIP 2 Feasibility Study to investigate the impact of these developments on Willesden Junction Station and Interchange, and to develop proposals to respond to these. The study was also tasked with advising on costing, development potential and potential phasing of the works.

A review of the existing station infrastructure identified a number of poorly performing areas such as passenger experience, complex platform interchange and poor intermodal interchange. Pedestrian modelling indicated a number of pinch points within the station which became problematic under future demand.

Analysis of wider issues associated with the station including urban realm place making, intermodal interchange, engineering and construction feasibility and – critically – the surrounding rail infrastructure were investigated by the team in order to inform a series of element studies around the areas of: Entrances, Interchange, Pedestrian Routes, Intermodal Strategy and Development Sites.

Following stakeholder evaluation, the design team developed strategic design proposals for the station, surrounding infrastructure, potential OSD and the station spatial arrangements. Three options were developed, named based on the configuration of the station entrances: Central, Dual and Offset.

In addition to being tested by a technical evaluation, described alongside the options within this report, the three options were scored by the stakeholder group against the following criteria: station in use; intermodal interchange; public realm potential and rail operations. The results are summarised in the adjacent table, along with the other leading technical criteria impacting on feasibility:

Table 9.1.1 : Option Summaries

	Central	Dual	Offset
	Main concourse between High Level and Low Level Platforms	Entrances at Western and Eastern ends of the station only	Main concourse located off-line from rail infrastructure
Full (2041) build out predicated on TMD removal?	Yes	Yes	Yes
Can be delivered with TMD in place?	Work-around could potentially be developed but impacts on step-free access proposals may prove problematic	TMD removal is required to facilitate a combined Platform P1/3, which is necessary for passenger access route from the west	Least sensitive to TMD removal, overbridge to Platforms P1/3 could be readily modified
Southern connection to OPDC	Pedestrian bridge	Road bridge	Road bridge
Development potential	Independent of station proposals	Independent of station proposals	Independent of station proposals
Phasing potential	Least sensitive to southern link to OPDC	Challenges if no TMD removal nor OPDC link	Least sensitive to TMD removal
Workshop evaluation: Station in use	4/5	2/5	4/5
Modelled dynamic performance	Acceptable	Some issues	Acceptable
Workshop evaluation: Intermodal Interchange	3/5	3/5	3/5
Workshop evaluation: Public Realm Potential	2/5	3/5	4/5
Workshop evaluation: Rail Operations	2/5	1/5	4/5

Stakeholder engagement has been achieved through stakeholder workshops integrated with the design development process. Alongside this process, the design options have been presented to OPDC Strategic Transport Panel, Harlesden Town Centre consultation and OPDC PLACE (Planning, Landscape, Architecture, Conservation and Engineering) review. The groups supported the strategic design proposals and emerging architecture, and comments were received to assist subsequent development of the proposals.

The next stage in the works would traditionally be a GRIP 3 study ("Option selection") or a RIBA 1/2 study ("Preparation and Brief/Concept Design") to identify a preferred option. Key items identified by the feasibility study which will require consideration at future stages are:

- The connectivity arrangements from the OPDC sites to the south, principally the north-south bridge, but also east-west connectivity through the site
- Integration of future intermodal, walking and cycling proposals resulting from ongoing studies in the OPDC area and the requirements emerging from these.
- Ensuring strong links between the station and Harlesden town centre to the north, notably consideration of the western entrance (or entrances) and the treatment of Station Approach as an animated streetscape.
- Rail stakeholder consultation on the removal of the turn-back facility at LL P2 and exploring the sensitivity of this impact on the rail network with regards to the operation (or potential removal) of the North London Line Link from the DC lines and depot.
- Co-ordination of Over Site and Adjacent Site proposals with the wider masterplan and development proposals for the OPDC sites.

In order to progress to GRIP Stage 3 and a Single Preferred Option (SPO) we would anticipate that the following decisions and information would be required:

- Revised briefing for the project, with a refreshed and narrowed brief.
- Survey of the existing station and structures, along with key assets around the site such as signal boxes, access under proposed footings, etc.
- Consultation on the time horizons for infrastructure change around the site (i.e. rail functions). Either a suitable alternative site for the TMD or an alternative means for trains to access the TMD requires investigation.
- Decision on inclusion or otherwise of the design impact of stopping the West Coast Main Line.
- Agree key risks and assumptions for the design.
- Determination of a single detailed scenario to work against.
- Address and respond to stakeholder and OPDC PLACE review comments.



Option 3, Offset Option indicating potential development